

# **Vendor Info File Definition**

## **Version 3.12**

---

Version 3.12  
October 8, 2020



## Revision History

Revision	Version	Issue Date	Comment
0.5	1.0	Aug 23, 2016	Initial release Revision 0.5.
0.51	1.0	Aug 24, 2016	Editorial fixes.
0.52	1.0	Aug 31, 2016	SVID/SVID Mode definitions added. SSSTX/RX_dir_support parameters marked as reserved/shall not be tested.
0.53	1.0	Sept 6, 2016	\$VIF_Specification and \$VIF_Producer fields added.
0.54	1.0	Sept 27, 2016	Editorial fixes.
0.90	1.0	Nov 18, 2016	Added new fields and tightened constraints among existing fields. Removed SSSTX/RX_dir_support fields.
0.91	1.0	Nov 22, 2016	Added additional constraints.
0.92	1.0	Nov 25, 2016	Editorial fixes.
0.93	1.0	Nov 30, 2016	Added new fields and tightened constraints among existing fields.
0.94	1.0	Dec 6, 2016	Editorial fixes.
0.95	1.0	Dec 7, 2016	Renamed Externally_Powered field to Unconstrained_Power.
0.96	1.0	Dec 7, 2016	Updated description of Unconstrained_Power field. Updated this Revision History.
1.00	1.0	Dec 8, 2016	Official release.
1.10	1.0	Mar 15, 2017	Renamed two fields and tightened constraints on another two.
1.11	1.0	Mar 21, 2017	Added support for PPS. Expanded support for Chunking.
1.20	1.0	June 13, 2017	Added additional support for PD 3.
1.21	1.0	June 30, 2017	Moved field to correct field group.
1.22	1.0	Sept 14, 2017	Added additional constraints to PDP fields. Set the Max Voltage to 21000 mV for all PDO Supply Types that have a Max Voltage field.
1.30	1.0	Dec 5, 2017	Added support for BC 1.2, Link Layer and Type-C Functional tests.

Revision	Version	Issue Date	Comment
1.31	1.0	Jan 16, 2018	Changed lower limit to PD_Power_As_Sink to 0. Editorial fixes.
1.32	1.0	Jan 26, 2018	Clarified requirements for Type_C_Can_Act_As_Device and Type_C_Can_Act_As_Host
1.33	1.0	Feb 7, 2018	Two new fields added to USB Host Fields.
1.34	1.0	Apr 26, 2018	Added new fields for OCP testing. Replaced Responds_To_Discov_SOP with two new fields Responds_To_Discov_SOP_UFP and Responds_To_Discov_SOP_DFP. Removed Structured_VDM_Version and Structured_VDM_Version_SOP Added new Product Power Fields section. Added new fields to USB Device section.
1.35	1.0	May 3, 2018	Clarified requirements for Product_Total_Source_Power.
1.36	1.0	May 9, 2018	Removed fields related to PD Consumer Port Capability Descriptor from section 3.2.5.
1.37	1.0	September 4, 2018	Converted Product_Total_Source_Power from watts to milliwatts. Removed constraint from Src_PD_OCP_UV_Threshold_Type<X>. Added support for non-CT VPDs Added new Port_Source_Power_Gang_Max_Power field to Product Power section. Renamed options for Type_C_Power_Source and Port_Source_Power_Type fields.
1.38	1.0	December 3, 2018	If Type_C_State_Machine is SRC, and Type_C_Can_Act_As_Device is YES, then both DR_Swap_to_*_Supported fields must be set to YES. The same for SNK/Hosts. Type_C_Sources_VCONN and Captive_Cable cannot both be set to YES. Added new Micro A/B option to Connector_Type. Made Captive_Cable field applicable to Type-B connectors.

Revision	Version	Issue Date	Comment
1.39	1.0	January 15, 2019	<p>Clarified language in *_Enter_Mode* fields.</p> <p>Added PSD as an option to Product_Type_UFP_SOP. Micro-A/B ports are possible on BC 1.2 Portable Devices.</p> <p>Renamed FR_Swap_Reqd_Type_C_Current to FR_Swap_Reqd_Type_C_Current_As_Initial_Source. Clarified the interaction between Connector_Type and Captive_Cable.</p> <p>Removed FR_Swap_Supported_As_Source. Added FR_Swap_Supported_As_Initial_Sink (to Dual Role section) which is to be set to YES in those situations wherein FR_Swap_Supported_As_Source would have been set to YES.</p>
1.40	1.0	February 1, 2019	Fixed numeric value of PSD option in Product_Type_UFP_SOP.
2.00	1.0	April 2, 2019	<p>Defined XML format for VIFs.</p> <p>Added support for VIFs that contain multiple ports. As part of this, added constraints to a number of fields that are sensitive to the contents of ports other than the one they're on.</p> <p>Do not require Type-A ports to support USB data when they are on a product that has a Type-C port that can act as a Source. Added new field Host_Supports_USB_Data to characterize this.</p>
2.01	1.0	June 4, 2019	<p>Errata:</p> <p>Added Host_Supports_USB_Data to the Schema in Appendix A.</p> <p>Added Requests_PR_Swap_As_Snk back. It was removed inadvertently from version 1.39.</p>
2.02	1.0	August 7, 2019	Clarified language for Product_Type_UFP_SOP, and removed "0 – Undefined" as an option when Type_C_Can_Act_As_Device is set to YES.
2.03	1.0	September 10, 2019	<p>In the Schema, relaxed the requirement that fields and field groups appear in a particular order.</p> <p>Removed requirements that Hub_Port_Number be unique.</p> <p>Added two new fields:</p> <p>FR_Swap_Type_C_Current_Capability_As_Initial_Sink and Master_Port.</p>
2.04	1.0	November 21, 2019	Removed constraint on USB Device fields: The DFP of an embedded host can act as the UFP of a USB Device (think smartphones).

Revision	Version	Issue Date	Comment
3.00	1.0	April 21, 2020	Added USB4 support for ports and cables. Constrain Micro A/B ports to USB2 speeds. Micro A/B ports may, but do not have to, act as USB Devices. Added new field Device_Supports_USB_Data to handle that. Clarified text for Accepts_PR_Swap_As_Src and Accepts_PR_Swap_As_Snk. Clarified that Cables must support SOP'.
3.01	1.0	July 27, 2020	Updates to PD_Specification_Revision: removed option 3 (Rev 3.0, Version 2.0), and updated language for the other two options.
3.10	1.0	September 9, 2020	Added support for VPDs. Added additional support for Active Cables. Added support for more granular PD Revision/Version numbers. Updated constraints for SVID Mode fields (both SOP and Cable). Editorial: specify the ranges of hexadecimal fields in both hex and decimal format. Editorial: add new Editorial Conventions section to the introduction. Added one section which specifies hex, decimal, and binary literals. Added a new appendix for the names of fields that have been removed from the spec.
3.11	1.0	October 5, 2020	Brought wording in line with source ECRs. Added new section 1.3.2 referencing potential errata. Removed requirement that USB4 host ports act as USB data devices.
3.12	1.0	October 9, 2020	Renamed field: from Active_Cable_USB2_Hub_Hops_Supported to Active_Cable_USB2_Hub_Hops_Consumed.

Copyright © 2016-2020, USB Implementers Forum, Inc.

All rights reserved.

A LICENSE IS HEREBY GRANTED TO REPRODUCE THIS SPECIFICATION FOR INTERNAL USE ONLY. NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, IS GRANTED OR INTENDED HEREBY.

USB-IF AND THE AUTHORS OF THIS SPECIFICATION EXPRESSLY DISCLAIM ALL LIABILITY FOR INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS, RELATING TO IMPLEMENTATION OF INFORMATION IN THIS SPECIFICATION. USB-IF AND THE AUTHORS OF THIS SPECIFICATION ALSO DO NOT WARRANT OR REPRESENT THAT SUCH IMPLEMENTATION(S) WILL NOT INFRINGE THE INTELLECTUAL PROPERTY RIGHTS OF OTHERS.

THIS SPECIFICATION IS PROVIDED "AS IS" AND WITH NO WARRANTIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE. ALL WARRANTIES ARE EXPRESSLY DISCLAIMED. NO WARRANTY OF MERCHANTABILITY, NO WARRANTY OF NON-INFRINGEMENT, NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, AND NO WARRANTY ARISING OUT OF ANY PROPOSAL, SPECIFICATION, OR SAMPLE.

IN NO EVENT WILL USB-IF OR USB-IF MEMBERS BE LIABLE TO ANOTHER FOR THE COST OF PROCURING SUBSTITUTE GOODS OR SERVICES, LOST PROFITS, LOSS OF USE, LOSS OF DATA OR ANY INCIDENTAL, CONSEQUENTIAL, INDIRECT, OR SPECIAL DAMAGES, WHETHER UNDER CONTRACT, TORT, WARRANTY, OR OTHERWISE, ARISING IN ANY WAY OUT OF THE USE OF THIS SPECIFICATION, WHETHER OR NOT SUCH PARTY HAD ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

**All product names are trademarks, registered trademarks, or servicemarks of their respective owners.**

## Contributors

<b>Name</b>	<b>Company</b>
Chuck Trefts	Ellisys
Mario Pasquali	Ellisys
Abel Astley	Ellisys
Tim McKee	Intel Corporation
Rahman Ismail	Intel Corporation
Stephanie S Wallick	Intel Corporation
Tyler Joe	LeCroy Corporation
Pat Crowe	MQP Electronics Ltd.
Sten Carlsen	MQP Electronics Ltd.
Soren Petersen (editor)	Specwerkz
Amanda Hosler	Specwerkz
Diane Lenox	Specwerkz
Angela Hardy	VTM
Jamie Grimm	VTM



# Table of Contents

Revision History.....	3
Contributors .....	8
Table of Contents .....	9
1 INTRODUCTION .....	11
1.1 Scope of the Document .....	11
1.2 Intended Audience.....	11
1.3 Document Conventions.....	11
1.3.1 Numbers.....	11
1.3.2 Errata.....	11
1.4 Reference Documents.....	11
2 ACRONYMS AND TERMS .....	13
3 SUBMISSION MATERIALS .....	17
3.1 Vendor Information File (VIF) .....	17
3.1.1 Introduction .....	17
3.1.2 Conformant and Valid VIFs.....	17
3.1.3 Vendor Info File Fields.....	17
3.1.4 File Formats.....	18
3.1.5 VIF Producers .....	22
3.1.6 VIF Consumers .....	22
3.1.7 VIF Testers.....	22
3.2 Vendor File Fields .....	24
3.2.1 Introduction .....	24
3.2.2 Product Fields.....	25
3.2.3 Component Fields .....	27
3.2.4 General PD Fields .....	31
3.2.5 USB Type-C Fields.....	38
3.2.6 USB4 Port Fields .....	40
3.2.7 USB4 Product Fields .....	42
3.2.8 USB Data – Upstream Facing Port Fields.....	48
3.2.9 USB Data – Downstream Facing Port Fields.....	49
3.2.10 PD Source Fields .....	51
3.2.11 PD Sink Fields .....	56
3.2.12 PD Dual Role Fields.....	59
3.2.13 SOP Discovery Fields .....	59
3.2.14 Alternate Mode Adapter (AMA) Fields .....	64
3.2.15 Battery Charging 1.2 Fields .....	65
3.2.16 Cable/eMarker Fields .....	66
3.2.17 Active Cable Fields.....	74
3.2.18 VCONN Powered Device (VPD) Fields .....	77
3.2.19 Repeater Fields.....	78
3.2.20 Product Power Fields .....	78
Appendix A: XML Schema Definition for XML-based VIF .....	80

## Vendor Info File Specification

Appendix B: Settings for USB4 Product Types .....	81
Appendix C: Removed Fields .....	82
Index of Field Names .....	83

# 1 INTRODUCTION

## 1.1 Scope of the Document

This document tests and/or checks for compliance with requirements specified in *[PowerDelivery2.0]*, *[PowerDelivery3.0]*, *[USBTyPe-C2.0]*, *[USB3.2]*, and *[USB4]*.

## 1.2 Intended Audience

This specification is intended for developers of Hosts, Hubs, Peripherals and Cables which have support for Power Delivery, USB Type-C™, or USB 3.2 capability.

## 1.3 Document Conventions

### 1.3.1 Numbers

In this document, a number with ‘h’ appended is hexadecimal. A number with ‘b’ appended is binary. A number with no suffix is decimal.

### 1.3.2 Errata

It may be necessary to issue corrections to this specification from time to time. They can be found at <https://compliance.usb.org/cv/VendorInfoFile/Errata/Current/>.

## 1.4 Reference Documents

The following referenced documents can be found on the USB-IF website [www.usb.org](http://www.usb.org):

<b><i>[BatteryCharging1.2]</i></b>	<i>Battery Charging Specification Revision 1.2</i>
<b><i>[Micro-USB1.01]</i></b>	<i>Universal Serial Bus Micro-USB Cables and Connectors Supplement to the USB 2.0 Specification, revision 1.01.</i>
<b><i>[OTG&amp;EH2.0]</i></b>	<i>On-The-Go and Embedded Host Supplement to the USB 2.0 Specification, Revision 2.0 plus errata and ECR</i>
<b><i>[OTG&amp;EH2.0ComplianceChecklist]</i></b>	<i>OTG&amp;EH 2.0 Compliance Checklist</i>
<b><i>[OTG&amp;EH3.0]</i></b>	<i>On-The-Go and Embedded Host Supplement to the USB 3.0 Specification, Revision 1.0 plus errata and ECR</i>
<b><i>[OTG&amp;EH3.0ComplianceChecklist]</i></b>	<i>OTG&amp;EH 3.0 Compliance Checklist</i>
<b><i>[PDCommunicationsEngineMOI]</i></b>	<i>Communications Engine PD Compliance MOI, developed by MQP Electronics Ltd.</i>
<b><i>[PDDeterministicMOI]</i></b>	<i>Deterministic PD Compliance MOI, developed by Ellisys</i>
<b><i>[PowerDelivery2.0]</i></b>	<i>USB Power Delivery Specification Revision 2.0</i>
<b><i>[PowerDelivery3.0]</i></b>	<i>USB Power Delivery Specification Revision 3.0, Version 2.0</i>
<b><i>[USB2.0]</i></b>	<i>Universal Serial Bus Revision 2.0 Specification including ECNs and errata</i>
<b><i>[USB3.2]</i></b>	<i>Universal Serial Bus Revision 3.2 including ECNs and errata.</i>

## Vendor Info File Specification

<b>[USB4]</b>	<i>Universal Serial Bus 4 (USB4™) Specification</i>
<b>[USB4DROM]</b>	<i>Universal Serial Bus 4 (USB4) Device ROM Specification (forthcoming)</i>
<b>[USBPeripheralChecklist]</b>	<i>USB Compliance Checklist, Peripheral (Excluding Hubs)</i>
<b>[USBPeripheralSilicon]</b>	<i>USB Compliance Checklist, Peripheral Silicon (Excluding Hub Silicon)</i>
<b>[USBSystemsChecklist]</b>	<i>USB Compliance Checklist, Systems</i>
<b>[USBType-C2.0]</b>	<i>USB Type-C™ Cable and Connector Specification Revision 2.0</i>
<b>[XML1.0]</b>	<i>Extensible Markup Language (XML) 1.0 (Fifth Edition)</i>
<b>[XMLSchema1.0]</b>	<i>W3C XML Schema Definition Language (XSD) 1.0</i>

## 2 ACRONYMS AND TERMS

This chapter lists and defines terms and abbreviations used throughout this specification. Other terms and abbreviations are provided in [\[PowerDelivery2.0\]](#), [\[PowerDelivery3.0\]](#) and [\[USBType-C2.0\]](#).

Term	Description
Attached	USB Power Delivery ports which are mechanically joined with USB cable.
BIST	Built In Self Test – Power Delivery testing mechanism for the Phy Layer.
Cold Socket	A downstream port receptacle that does not apply vSafe5V on VBUS until a plug insertion is detected.
Complete PD Specification Number	<p>The following fields considered as 4-digit binary coded decimal, listed from most significant to least significant:</p> <ul style="list-style-type: none"> <li><i>PD_Spec_Revision_Major</i></li> <li><i>PD_Spec_Revision_Minor</i></li> <li><i>PD_Spec_Version_Major</i></li> <li><i>PD_Spec_Version_Minor</i></li> </ul> <p>Example: PD Specification Revision 3.0, Version 2.0:</p> <ul style="list-style-type: none"> <li><i>PD_Spec_Revision_Major</i> = 3</li> <li><i>PD_Spec_Revision_Minor</i> = 0</li> <li><i>PD_Spec_Version_Major</i> = 2</li> <li><i>PD_Spec_Version_Minor</i> = 0</li> </ul> <p>The Complete PD Specification Number is 3020h.</p>
Component	A part of a Qualifying Product which can be considered independently from the product as a whole. An example of a Component is a single USB Port.
Connected	USB Power Delivery ports which are actively communicating using the USB Power Delivery protocol.
Consumer	The capability of a PD Port (typically a Device's upstream port) to sink power from the power conductor (e.g. VBUS).
Consumer/Provider	A Consumer with the additional capability to act as a Provider.
Contract	An agreement on both power level and direction reached between a Port Pair. A contract may be explicitly negotiated between the Port Pair or may be an implicit power level defined by the current state. While operating in Power Delivery mode there will always be either an explicit or implicit contract in place. The agreement may only be altered in the case of a negotiation, Hard Reset or failure of the Source.
Dead Battery	A device has a Dead Battery when the battery in a device is unable to power its functions.
Device	When lower cased (device), it refers to any USB product, either device or host.
Device Policy Manager	Module running in a Provider or Consumer that applies Local Policy to each port in the Device via the Policy Engine.

Term	Description
Downstream Port/Downstream Facing Port (DFP)	Either a port in the Host or the ports defined in <a href="#">[USB2.0]</a> , <a href="#">[USB3.2]</a> , <a href="#">[USB4]</a> or USB Type-C as defined in <a href="#">[USBType-C2.0]</a> . The default Host and Source.
Dual-Role Device	A product containing one or more Dual-Role Ports that are capable of operating as either a Source or a Sink.
Dual-Role Port	A Consumer/Provider or Provider/Consumer capable port that is a port capable of operating as either a Source or Sink.
HDD	A Hard Disk Drive.
Hard Reset	This is initiated by HardReset signaling from either Port Partner. It restores VBUS to the default condition and resets the PD communications engine to its default state.
IR Drop	The voltage drop across the cable and connectors between the Source and the Sink. It is a function of the resistance of the ground wire in the cable plus the contact resistance in the connectors times the current flowing over the path.
Local Policy	Every Device has its own Policy, called the Local Policy, that is executed by its Policy Engine to control its power delivery behavior. The Local Policy at any given time may be the default policy, hard coded or modified by changes in operating parameters or one provided by the system Host or some combination of these. The Local Policy optionally may be changed by a System Policy Manager.
Message	The packet payload consisting of a header for control messages and a header and data for data messages as defined in Sections 6.2, 6.3, and 6.4 of <a href="#">[PowerDelivery2.0]</a> and <a href="#">[PowerDelivery3.0]</a> .
Messaging	Communication in the form of messages as defined in Sections 6.2, 6.3, and 6.4 of <a href="#">[PowerDelivery2.0]</a> and <a href="#">[PowerDelivery3.0]</a> .
Negotiation	This is the PD process whereby:  The Source advertises its capabilities.  The Sink requests one of the advertised capabilities.  The Source acknowledges the request and alters its output to satisfy the request.  The result of the negotiation is a contract for power delivery/consumption between the Port Pair.
Packet	One entire unit of PD communication including a preamble, SOP*, payload, CRC and EOP as defined in Sections 6.2 of <a href="#">[PowerDelivery2.0]</a> and <a href="#">[PowerDelivery3.0]</a> .
PD	USB Power Delivery
PD Capable	A port that supports USB Power Delivery.
PDUSB	USB Device Port or USB Host Port that is PD capable.
PD Connection	A Port Pair with an established contract.

Term	Description
Phy Layer	The Physical Layer responsible for sending and receiving messages across VBUS between a Port Pair.
Policy	Policy defines the behavior of PD capable parts of the system and defines the capabilities it advertises, requests made to (re)negotiate power and the responses made to requests received.
Policy Engine	The Policy Engine interprets the Device Policy Manager's input in order to implement Policy for a given port and directs the Protocol Layer to send appropriate messages.
Port	An interface typically exposed through a receptacle, or via a plug on the end of a hard-wired captive cable. USB Power Delivery defines the interaction between a Port Pair.
Port Pair	Two attached PD Ports.
Port Partner	The USB Power Delivery contract is negotiated between a Port Pair connected by a USB cable. These ports are known as Port Partners.
Power Conductor	The wire delivering power from the Source to Sink. For example, USB's VBUS.
Power Consumer	See Consumer
Power Provider	See Provider
Qualifying Product	The Product that is described by a particular Vendor Info File.
Protocol Error	An unexpected or unknown message that cannot be handled by a given implementation.
Protocol Layer	The entity that forms the messages used to communicate information between Port Partners.
Provider	A capability of a PD Port (typically a Host, Hub, or Wall Wart DFP) to source power over the power conductor (e.g. VBUS). This corresponds to a Type-A or a Type-C Port with RP asserted on its CC Wire.
Provider/Consumer	A Provider with the additional capability to act as a Consumer. This corresponds to a Dual-Role Type-A Port or a Dual-Role Type-C Port with RP asserted on its CC Wire.
Reserve	Power which is kept back by a Provider in order to ensure that it can meet total power requirements of attached Consumers on at least one port.
Safe Operation	Sources must have the ability to tolerate 5V applied by both Port Partners.
Signaling	An ordered set of four K-codes used to indicate a particular line symbol e.g. Hard Reset as defined in Section 5.6.4 of <b>[PowerDelivery2.0]</b> and <b>[PowerDelivery3.0]</b> .
Sink	The port consuming power from VBUS; most commonly a Device.
Soft Reset	A process that resets the PD communications engine to its default state.
Source	A role a port is currently taking to supply power over VBUS; most commonly a Host or Hub downstream port.

Term	Description
System Policy	Overall system policy generated by the system, broken up into the policies required by each Port Pair to affect the system policy. It is programmatically fed to the individual Devices for consumption by their Policy Engines.
System Policy Manager	Module running on the USB Host. It applies the System Policy through communication with PD capable Consumers and Providers that are also connected to the Host via USB.
Tester	The Tester is assumed to be a piece of test equipment, or an assembly of pieces of test equipment, which manage(s) the testing process of a PD Qualifying Product.
Upstream Port/Upstream Facing Port (UFP)	Typically, a B port on a Device as defined in <b>[USB2.0]</b> , <b>[USB3.2]</b> , <b>[USB4]</b> or Type-C Port as defined in <b>[USBType-C2.0]</b> . The default Device and Sink.
USB Powered State	Synonymous with the <b>[USB2.0]</b> and <b>[USB3.2]</b> definition of the powered state.
USB4 Product	A Qualifying Product which includes one or more Ports that support USB4 as specified in <b>[USB4]</b> .
VI	Same as power (i.e. voltage * current = power)
Wall Wart	A power supply or “power brick” that is plugged into an AC outlet. It supplies DC power to power a device or charge a battery.



## 3 SUBMISSION MATERIALS

### 3.1 Vendor Information File (VIF)

#### 3.1.1 Introduction

In order to expedite the testing process, the Vendor is required to provide a text file which defines in detail, the Qualifying Product to be tested. One such file is required for any significantly different configuration; for example, a Qualifying Product which needs to demonstrate correct functionality with or without External Power would need two files; one with the *Unconstrained\_Power* field set to YES, and one with it set to NO.

The full test suite should then be run for each such file.

It is the intention that the testing is as automated as possible, so that interaction by the vendor during a test is not expected, or indeed encouraged.

The reason for this is that such details as Source or Sink Capabilities of the Qualifying Product should always match the Vendor Information File (VIF) during a given test sequence, thus allowing the vendor intentions to be checked against the Qualifying Product presented for test.

#### 3.1.2 Conformant and Valid VIFs

An XML format VIF that conforms to the XML schema given in Appendix A is *conformant*. All Text format VIFs are conformant.

A *valid* VIF is a conformant VIF that adheres to all requirements given in this specification.

#### 3.1.3 Vendor Info File Fields

A Vendor Info File consists of a number of *Fields*, which describe the capabilities of the Qualifying Product. Section 3.2 of this specification provides definitions for all fields that may appear in a Vendor Info File.

There are three kinds of fields:

1. **String fields**, which define a UTF-8 encoded text string. Unless otherwise noted, a string field, if required, shall contain one or more non-white space characters. A VIF producer may optionally strip leading and trailing white space when writing to file.
2. **Numeric fields**, which define a non-negative integer
3. **Boolean fields**, which may take one of the values *true* or *false*.

Future versions of this specification may deprecate, remove, rename or otherwise transform certain fields defined in this version of the specification. These fields are listed, with an explanation in Appendix C. Unless otherwise specified, these fields shall be valid in a conformant VIF. Upon encountering a field listed in Appendix C, a VIF Producer shall perform any transformations specified therein. A VIF Producer shall not emit a VIF that contains any field listed in Appendix C.

Unless otherwise specified, all Required fields in a Valid VIF shall have a value.

Section 3.1.4 defines valid formats for Fields in a Vendor Info File.

### 3.1.4 File Formats

The Vendor Info File is a UTF-8 encoded text file. This specification defines two formats for Vendor Info Files: Text and XML.

A Vendor Info File describes a physical object which has one or more *Components*. A Component may be either a *Port*, a *Cable*, or a *Repeater*.

A conformant XML format Vendor Info File may contain 0 or more Components. A valid XML format VIF may contain a single Cable, a single Repeater, or 1 or more Ports.

A text Vendor Info File describes a single Component.

*Note: an example of a multi-component device is a PDUSB Hub with 4 Downstream Facing Ports. The VIF would then contain 5 components: 1 for the Upstream Facing Port and 4 for the Downstream Facing Ports.*

#### 3.1.4.1 Vendor Info File XML Format

An *XML-format* Vendor Info File is an XML 1.0 document that conforms to the XML 1.0 Schema Definition (XSD) given in Appendix A. In the event of a conflict between the informal description in this section and the XSD, the XSD shall take precedence.

Unless otherwise specified, all elements in a Conformant VIF are optional. However, when they appear, they shall conform to the requirements given below. In particular, unless otherwise specified, Fields shall be non-empty.

XML comments may be inserted at any point allowed in the XML base specification.

#### **Components**

A Conformant VIF contains 0 or more Fields, and 0 or more Components, subject to the restrictions defined in Appendix A.

Components contain shall contain 0 or more fields and 0 or more field group collections.

#### **Fields**

A VIF Field consists of a single XML Element where the element name is the name of a VIF field. See Appendix A for a list of all valid field names.

The value of a String field is contained in the contents of the field element.

- An example of a String field is `<Port_Label>UFP</Port_Label>`.

The value of a Numeric field is a decimal number, contained in the required `value` attribute of the field. The field may optionally include text in its content area.

- Examples of Numeric fields:
  - a. `<Num_Fixed_Batteries value="3"/>`.

- b. `<Manufacturer_Info_VID_Port value="255">0x00FF</Manufacturer_Info_VID_Port>`
- c. `<VIF_Product_Type value="0">Port</VIF_Product_Type>`
- d. `<Src_PDO_Voltage value="100">5000 mV</Src_PDO_Voltage>`

*Note: it is recommended that VIF Producers provide use the content area to additional context for Numeric field values as appropriate, possibly as shown in examples b-d above.*

The value of a Boolean field is contained in the required `value` attribute of the field. Valid values are "true" and "false". The field may optionally include text in its content area.

- Examples of Boolean fields:

- a. `<USB_PD_Support value="true"/>`.
- b. `<Captive_Cable value="false">NO</Captive_Cable/>`

### **Field Group Collections**

The XSD defines the following field group collections. See section 3.2 for a full description of their contents and properties.

- **RouterList** – contains one or *Router* elements. See section 3.2.7.1 for information on the relevant fields.
- **SrcPdoList** – contains one or more *SrcPDO* elements. See section 3.2.10.1 for information on the relevant fields.
- **SnkPdoList** – contains one or more *SnkPDO* elements. See section 3.2.11.1 for information on the relevant fields.
- **SopsVIDList** – contains one or more *SOPSVID* elements. See section 3.2.13.1 for information on the relevant fields.
- **SOPSVIDModeList** – contains one or more *SOPSVIDMode* elements. SOPSVIDModeList shall be a sub-element of a SOPSVID. See section 3.2.13.2 for information on the relevant fields.
- **CableSVIDList** – contains one or more *CableSVID* elements. See section 3.2.16.1 for information on the relevant fields.
- **CableSVIDModeList** – contains one or more *CableSVIDMode* elements. CableSVIDModeList shall be a sub-element of a CableSVID. See section 3.2.16.2 for information on the relevant fields.

### **Field Uniqueness**

A Field in a Component which is not a member of a Field Group shall appear at most once in that Component.

A Field in a Field Group which is not a member of a descendent Field Group shall appear at most once in that Field Group.

### **/VIF**

The root element that describes the Qualifying Product. It contains introductory material followed by one or more Components. This field is required.

### **/VIF/VIF\_Specification**

Gives the version number of the VIF specification to which the VIF conforms. This field is required.

### **/VIF/VIF\_App**

Immediately follows */VIF/VIF\_Specification*. Describes the application that was used to generate the VIF. This field is required.

The contents of this field shall be one of the following. When employing method 1, all three fields referenced therein are required. When employing method 2, */VIF/VIF\_App/Description* is required.

1. The following three elements, in order
  - a. **/VIF/VIF\_App/Vendor** – a free-text string describing the vendor of the application.
  - b. **/VIF/VIF\_App/Name** – a free-text string giving the name of the application.
  - c. **/VIF/VIF\_App/Version** – the version number of the application.
2. **/VIF/VIF\_App/Description** – a free-text string that describes the application.

A VIF producer shall employ method 1 when writing a VIF to file.

When reading a text-Format VIF, VIF a consumer shall employ method 2, importing the *\$VIF\_Producer* field into */VIF/VIF\_App/Description*.

### **/VIF/Vendor\_Name**

### **/VIF/Model\_Part\_Number**

### **/VIF/Product\_Revision**

### **/VIF/TID**

Free text fields that describe the Qualifying Product. See section 3.2.2 for further information.

### **/VIF/VIF\_Product\_Type**

The highest-level category to which the Qualifying Product belongs. See section 3.2.2 for further information.

### **/VIF/Product**

An optional element that contains Fields or Field Group Lists that pertain to the Qualifying Product as a whole.

### **/VIF/RouterList**

An optional element that contains one or more *Router* elements.

### **/VIF/RouterList/Router**

Contains one or more Fields or Field Group Lists that pertain to a single USB4 Router.

### **/VIF/Certification\_Type**

Designates which set of tests should be run on Qualifying Product. If */VIF/VIF\_Product\_Type* is not present, then neither shall this.

### **/VIF/Component**

0 or more components that fully describe a component of the Qualifying Product. If `/VIF/VIF_Product_Type` is not present, then the number of components shall be 0.

### 3.1.4.2 Vendor Info File Text Format

A *text-format* Vendor Info File consists of a number of *Parameter Definitions*, defined as follows:

- A semicolon ';' and anything which follows on that line is a comment and shall be ignored.
  - A semicolon within a string Value Token shall not initiate a comment.
- Empty lines or lines that consist entirely of whitespace are permitted and shall be ignored.
- Each Parameter Definition shall be defined on a single line of text.
- Each Parameter Definition consists of a *Parameter Name*, followed by a colon ':', followed by a single *Value Token* that represents either a 32-bit value or a text string.
- Parameter Definitions may appear in any order within the Vendor Info File.
- Parameter Names shall consist of the following:
  - For string values only, an initial '\$' character.
  - One or more upper case letters in the range [A-Z], lower case letters in the range [a-z], digits, or underscores. The first character shall not be a digit.
    - *Note: in revisions of this specification prior to revision 2.00, single quotes were also permitted in Parameter Names. VIF Consumers that support older VIFs should take this into account.*
  - Parameter Names shall be unique across the Vendor Info File.
  - Parameter Names are case-insensitive.
- The Value Token of a String field consists of an opening double-quote '"', arbitrary UTF-8 text, and a closing double-quote.
  - If there are more than two double-quotes in the Value Token area, then the final double-quote on the line that is not part of a comment shall close the string Value Token. Thus, `$StringVar: "This is "quoted" text"` is valid, with the Value Token equal to `This is "quoted" text`.
- The Value Token of a Numeric field, shall be a decimal or a hexadecimal number.
  - Hexadecimal values are prefixed with the strings "0x" or "0X".
- The Value Token of a Boolean field shall be one of the strings "YES" (or "1") or "NO" (or "0"), meaning *true* or *false* respectively.
  - "YES" and "NO" are case-insensitive.
- Blank space is permitted and shall be ignored in the following places:
  - Prior to the Parameter Name.
  - Prior to and following the colon that separates the Parameter Name from the Value Token.

- Following the Value Token.
- A single Parameter Definition shall be parsed as if the following steps are taken in order:
  - Comments are removed.
  - Leading and trailing whitespace is removed.
  - The Parameter Definition is validated.
  - The Parameter Name and Value Token are extracted.

### 3.1.5 VIF Producers

A **VIF Producer** is an application designed to generate a Vendor Info File.

- VIF Producers shall support XML format VIFs.
- VIF Producers shall omit inapplicable fields from the VIF upon saving.
- VIF Producers shall not emit a VIF that is not conformant.
- VIF Producers generate may discard comments from an input VIF file or may generate new ones.

### 3.1.6 VIF Consumers

A **VIF Consumer** is an application that can take a Vendor Info File as input. Examples of VIF Consumers include test software, or a dedicated Vendor Info File Editor.

- VIF Consumers shall process all conformant VIFs.
- VIF Consumers may reject a non-conformant VIF with no further action.

### 3.1.7 VIF Testers

A **VIF Tester** (or **Tester**) is a VIF Consumer that uses the Vendor Info File for the purpose of running compliance tests on the Qualifying Product.

- Inappropriate parameters for the Qualifying Product in question (e.g. cable parameters for a port) shall be ignored by VIF Testers.
- A VIF with inconsistent applicable parameters for the Qualifying Product shall be recorded as a failure by VIF Testers. The VIF may then be redirected to a VIF editor.
- A VIF with more than one definition for the same Parameter shall be recorded as a failure by VIF Testers and all instances of that definition shall be discarded. The VIF may then be redirected to a VIF editor.
- A VIF Tester shall take the VIF as the authority on how the Qualifying Product shall behave, and any inconsistency between the VIF and the behavior of the Qualifying Product shall be recorded by the VIF Tester as a failure.

## Vendor Info File Specification

- If a Vendor Info File contains a field that is marked as to be **ignored by Testers**, a VIF Tester shall immediately discard it without further analysis.

## 3.2 Vendor File Fields

The following is a listing of all valid Fields that a Vendor Info File may have, with additional characterizations as required.

### 3.2.1 Introduction

#### 3.2.1.1 Boolean fields

In the following sections, a field marked (Y/N) is Boolean.

#### 3.2.1.2 XML vs. Text field names

Some fields may have different names the text format and XML format. In this case, the XML name is given first, with the name in angle brackets, followed by the text name.

#### 3.2.1.3 Indexed fields

Some fields may appear more than once within a Vendor Info File.

In XML-format VIFs, the structure given in the XML Schema allows these fields to be distinguished from each other.

In text-format VIFs, this is not possible. In this case, these fields are distinguished by interpolating one or more index numbers into the field name. Thus, the text-format parameter name *SVID2\_mode1\_recog\_mask* references the first listed SVID mode of the second listed SVID of the Qualifying Product. In this document, these numbers are given in the form <X>. Thus *SVID2\_mode1\_recog\_mask* would be referenced as *SVID<X>\_Mode<Y>\_Recog\_Mask*. Unless otherwise specified, index numbers shall start at 1, and be incremented by 1 for each item.

For these fields, the XML-format field name shall be the name given here with the index number placeholders removed. Thus, the XML field name of *SVID<X>\_Mode<Y>\_Recog\_Mask* is *SVID\_Mode\_Recog\_Mask*.

#### 3.2.1.4 USB4 Products

The VIF Field requirements in this specification use the following definitions

- **USB4 Port:** A Component in which *USB4\_Supported* is set to YES. (Also referred to as a Component which **supports USB4**)
- **USB4 Upstream Facing Port (USB4 UFP):** A Component in which *USB4\_UFP\_Supported* is set to YES.
- **USB4 Downstream Facing Port (USB4 DFP):** A Component which *USB4\_DFP\_Supported* are both set to YES.
- **USB4 Dual Role Data Port (USB4 DRD):** A Component which is both a **USB4 Downstream Facing Port** and a **USB4 Upstream Facing Port**.
- **USB4 Peripheral:** A Qualifying Product which contains a **single USB4 Port** with the following property:
  - It is a **USB4 UFP** and not a **USB4 DRD**.



- **USB4 Hub:** A Qualifying Product with two or more **USB4 Ports** with the following properties:
  - No USB4 Ports are **USB4 DRDs**.
  - One USB4 Port is a **USB4 UFP**.
  - The remaining USB4 Ports are **USB4 DFPs**.
- **USB4 Dock:** A **USB4 Hub** on which `USB4_Dock` is set to YES. *Note: unless otherwise specified, all requirements that apply to **USB4 Hubs** shall also apply to **USB4 Docks**.*
- **USB4 Host:** A Qualifying Product with one or more **USB4 Ports** with the following properties:
  - All USB4 Ports are **USB4 DFPs** that are optionally **USB4 DRDs**.
- A **USB4 Port** is **associated with a USB4 Router** when the `USB4_Router_Index` for that **USB4 Port** is set equal to the `USB4_Router_Id<X>` of the USB4 Router.

*Note: All **USB4 Ports** must be a **USB4 UFP**, a **USB4 DFP** or both.*

*Note: A Qualifying Product that has a **USB4 Port** must be a **USB4 Peripheral**, a **USB4 Hub**, or a **USB4 Host**.*

### 3.2.2 Product Fields

The fields in this section are required for all conformant VIFs

#### <VIF\_Specification>, \$VIF\_Specification (text format only)

Vendor Info Files that conform to this specification shall set this field to 3.12.

The Vendor Info File specification to which the VIF is compliant. This field is generated automatically by the VIF producer. This field may be displayed to the user, but it shall not be modifiable by the user within the VIF producer. If the VIF producer is editing an existing VIF then it shall update this field to the most recent version of the Vendor Info File specification that it currently supports when it saves the VIF.

In a text-format VIF, the format of this field shall be one of the following:

- Revision <Num>, Version <Num>
- Version<Num>

where the <Num>s are version numbers in the form **X.Y[.].**

See section 3.1.4.1 and Appendix A for requirements for XML format VIFs.

When generating a new VIF, VIF producers shall populate this field with the most recent version of this specification that it supports.

#### < VIF\_App>, \$VIF\_Producer (text format only)

Information regarding the VIF producer used to generate the VIF. This field shall be generated automatically by the VIF producer. This field may be displayed to the user, but it shall not be modifiable by the user within the VIF producer. If a VIF producer is editing an existing VIF then it shall update this field to its current version when it saves the VIF.

In a text-format VIF, this field is an unrestricted text string defined by the VIF producer vendor. However, vendors are encouraged to include vendor name, app name and app version.

See section 3.1.4.1 and Appendix A for requirements for XML format VIFs.

When generating a new VIF, VIF producers shall populate this field.

This field may be ignored by VIF consumers.

**<Vendor\_Name>, \$Vendor\_Name (text format only)**

To be provided by the Vendor. This is a string field.

If the Qualifying Product has a Vendor Name entry in USB4 DROM, then this field should be identical to that entry.

**<Model\_Part\_Number>, \$Model\_Part\_Number (text format only)**

To be provided by the Vendor. This field should match what appears in the USB-IF Product Registration form. This is a string field.

If the Qualifying Product has a Model Name entry in USB4 DROM, then this field should be identical to that entry.

The USB-IF uses this field and *Product\_Revision* to generate the product name in the USB Integrator's List.

**<Product\_Revision>, \$Product\_Revision**

To be provided by the Vendor. This field should match what appears in the USB-IF Product Registration form. This is a string field.

The USB-IF uses this field and *Model\_Part\_Number* to generate the product name in the USB Integrator's List.

**<TID>, \$TID**

Provided by the USB-IF. This is a string field.

**VIF\_Product\_Type**

The highest-level category into which the Component being tested falls. Valid options are:

- 0 - Port Product (contains one or more ports)
- 1 - Cable
- 2 - Repeater

**Certification\_Type**

What is the USB-IF certification category under which the Qualifying Product is to be submitted? This field shall be set to the same value as the one on the USB-IF Product Registration form.

If *VIF\_Product\_Type* is set to 0 (Port Product), then valid options are:

- 0 - End Product
- 1 - Reference Platform
- 2 - Silicon

If *VIF\_Product\_Type* is set to 1 (Cable), then valid options are:

- 0 - End Product
- 2 - Silicon

If *VIF\_Product\_Type* is set to 2 (Repeater), then this field shall be set to 2 (Silicon).

### Product\_VID

The Vendor ID of the Qualifying Product.

For **USB4 Peripherals** and **USB4 Hubs**, this field shall have the same value as the *idVendor* field of the *Product Descriptor Entry* in USB4 DROM.

This field shall be identical to the following fields in all instances when these fields are required:

*Manufacturer\_Info\_VID\_Port*  
*USB\_VID*  
*Manufacturer\_Info\_VID*  
*USB\_VID\_SOP*

If *Certification\_Type* is set to 2 (Silicon), then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is set to 2 (Repeater), then this field shall be ignored by Testers.

### 3.2.3 Component Fields

The fields in this section are required for all Qualifying Products unless otherwise specified.

#### <Port\_Label>, \$Port\_Label

To be provided by the Vendor. This field shall correspond with the port label given on the device picture submitted to USB-IF by the Vendor along with the VIF. This is a string field.

If *VIF\_Product\_Type* is not set to 0 (Port Product) this field shall be ignored by Testers.

This field shall be unique to each Component.

On all Components for which *DFP\_VDO\_Port\_Number* is required, this field shall begin with one or more digits that, when converted to an integer, shall be set equal to it.

*Note: this allows DFPs to have descriptive text.*

*The following values are valid for this field when DFP\_VDO\_Port\_Number is required. The substring used in validation is bolded:*

- "3"
- "24"
- "0012"

- " 6"
- "5-DRD"
- "2USB4"

*The following are not valid when DFP\_VDO\_Port\_Number is required:*

- "DFP"
- "DFP-2"

*"Port2-DRD"*

### Connector\_Type

The connector type of a Port. Valid options are:

- 0 - Type-A (includes mini-A and micro-A)
- 1 - Type-B (includes mini-B, micro-B, and Components that present a Type-A plug)
- 2 - USB Type-C (includes captive cable Components that present a USB Type-C plug)
- 3 - Micro A/B

If *VIF\_Product\_Type* is not set to 0 (Port Product), then this field shall be ignored by Testers.

If the Component does not have an accessible port and presents a Type-A plug, then set this field to 1 (Type-B) and set *Captive\_Cable* to YES.

If the Component does not have an accessible port and presents a USB Type-C plug, then set this field to 2 and set *Captive\_Cable* to YES.

### USB4\_Supported (Y/N)

Indicates whether or not this Component supports USB4.

If *VIF\_Product\_Type* is not set to 0 (Port Product) or 1 (Cable), then this field shall be ignored by Testers.

If *Connector\_Type* is not set to 2 (USB Type-C), then this field shall be ignored by Testers.

*Note: if this field is set to YES for any Component, the vendor of the Qualifying Product shall provide a test platform that supports USB4 testing.*

### USB4\_Router\_Index

The Router ID of the Router that owns this Component. This field shall be set to the *USB4\_Router\_ID<X>* of a Router defined in the current VIF.

Valid values are in the range 0 - 15.

If *USB4\_Supported* is not set to YES, then this field shall be ignored by Testers.

### USB\_PD\_Support (Y/N)

Does this product support USB Power Delivery?

If *VIF\_Product\_Type* is set to 0 (Port Product) and *Connector\_Type* is not set to 2 (Type-C), then this field shall be set to NO.

If *VIF\_Product\_Type* is set to 1 (Cable) then this field shall be set to YES.

If *VIF\_Product\_Type* is set to 2 (Repeater) then this field shall be ignored by Testers.

If *USB4\_Supported* is set to YES, then this field shall be set to YES.

### PD\_Port\_Type

The PD capabilities of the Qualifying Product.

Valid options are:

- 0 - Consumer Only (asserts Rd all the time)
- 1 - Consumer/Provider (asserts Rd at startup and can be directed to assert Rp)
- 2 - Provider/Consumer (asserts Rp at startup and can be directed to assert Rd)
- 3 - Provider Only (asserts Rp)
- 4 - DRP (toggles between asserting Rp and Rd)
- 5 - eMarker (connects to its partner through a captive eMarker cable).

If *VIF\_Product\_Type* is not set to 0 (Port Product), then this field shall be ignored by Testers.

If *USB\_PD\_Support* is not set to YES, then this field shall be ignored by Testers.

If *Connector\_Type* is not set to 2 (Type-C), then this field shall be ignored by Testers.

If *USB4\_Supported* is set to YES, then this field shall not be set to 5 (eMarker).

### Type\_C\_State\_Machine

Indicates which Type-C connection state machine is implemented on the DUT. If *Connector\_Type* is not set to 2 (Type-C) then this field shall be ignored by Testers.

If *USB\_PD\_Support* is set to YES and *PD\_Port\_Type* is equal to 0 (Consumer Only) or 5 (eMarker), then valid options are:

- 1 - SNK

If *USB\_PD\_Support* is set to YES and *PD\_Port\_Type* is equal to 1 (Consumer/Provider), then valid options are:

- 1 - SNK
- 2 - DRP

If *USB\_PD\_Support* is set to YES and *PD\_Port\_Type* is equal to 2 (Provider/Consumer), then valid options are:

- 0 - SRC
- 2 - DRP

If *USB\_PD\_Support* is set to YES and *PD\_Port\_Type* is equal to 3 (Provider only), then valid options are:

- 0 - SRC

If *USB\_PD\_Support* is set to YES and *PD\_Port\_Type* is equal to 4 (DRP), then valid options are:

- 2 - DRP

If *USB\_PD\_Support* is set to NO, then valid options are:

- 0 - SRC
- 1 - SNK

2 - DRP

Captive\_Cable (Y/N)

Indicates whether this Component has a captive cable. Any Component that presents a Type-A or USB Type-C plug is considered to have a captive cable, even if there is nothing visible that looks like a cable (e.g. a USB thumb-drive).

This field and *Type\_C\_Sources\_VCONN* cannot both be set to YES.

If *Connector\_Type* is not set to 1 (Type-B) or 2 (Type-C) then this field shall be ignored by Testers.

If *PD\_Port\_Type* is set to 5 (eMarker), then this field shall be set to YES.

Port\_Battery\_Powered (Y/N)

Can this Component be powered by one or more batteries?

If *VIF\_Product\_Type* is not set to 0 (Port Product), then this field shall be ignored by Testers.

BC\_1\_2\_Support

What Battery Charging 1.2 features does the Qualifying Product support?

If *Port\_Battery\_Powered* is set to YES and *Type\_C\_State\_Machine* is set to 2 (DRP), then valid options are:

- 0 - None
- 1 - Portable Device
- 2 - Charging Port
- 3 - Both

If *Port\_Battery\_Powered* is set to YES and *Connector\_Type* is set to 1 (Type-B) or 3 (Micro A/B), then valid options are:

- 0 - None
- 1 - Portable Device

If *Port\_Battery\_Powered* is set to YES and *Type\_C\_State\_Machine* is set to 1 (SNK), then valid options are:

- 0 - None
- 1 - Portable Device

If *Connector\_Type* is set to 0 (Type-A), then valid options are:

- 0 - None
- 2 - Charging Port

If *Connector\_Type* is set to 2 (Type-C) and *Type\_C\_State\_Machine* is set to 0 (SRC), then valid options are:

- 0 - None
- 2 - Charging Port

If *Port\_Battery\_Powered* is set to NO and *Connector\_Type* is set to 2 (Type-C) and *Type\_C\_State\_Machine* is set to 2 (DRP), then valid options are:

- 0 - None

2 - Charging Port

If *Port\_Battery\_Powered* is set to NO and *Connector\_Type* is set to 1 (Type-B), then valid options are:

0 - None

If *Port\_Battery\_Powered* is set to NO and *Type\_C\_State\_Machine* is set to 1 (SNK), then valid options are:

0 - None

If *VIF\_Product\_Type* is not set to 0 (Port Product), then this field shall be ignored by Testers.

### 3.2.4 General PD Fields

The fields in this section are required for all Qualifying Products that support Power Delivery (that is, where *USB\_PD\_Support* is set to YES) and shall be ignored by Testers otherwise.

#### PD\_Spec\_Revision\_Major

The Major Revision number of the highest PD Specification the Qualifying Product supports.

Valid values are in the range 2 - 9.

If *USB4\_Supported* is set to YES, then the Complete PD Specification Number shall be greater than or equal to 3020h. In particular, this field shall be greater than or equal to 3.

#### PD\_Spec\_Revision\_Minor

The Minor Revision number of the highest PD Specification the Qualifying Product supports.

Valid values are in the range 0 - 9.

If *USB4\_Supported* is set to YES, then the Complete PD Specification Number shall be greater than or equal to 3020h.

#### PD\_Spec\_Version\_Major

The Major Version number of the highest PD Specification the Qualifying Product supports.

Valid values are in the range 0 - 9.

If *USB4\_Supported* is set to YES, then the Complete PD Specification Number shall be greater than or equal to 3020h.

#### PD\_Spec\_Version\_Minor

The Minor Version number of the highest PD Specification the Qualifying Product supports.

Valid values are in the range 0 - 9.

If *USB4\_Supported* is set to YES, then the Complete PD Specification Number shall be greater than or equal to 3020h.

### PD\_Specification\_Revision

Which revision of the PD Specification is the Qualifying Product compliant with?

Valid options are:

- 1 - Revision 2
- 2 - Revision 3

If *USB4\_Supported* is set to YES, then this field shall be set to 2 (Revision 3).

If *PD\_Spec\_Revision\_Major* is set to 2, this field shall be set to 1 (Revision 2).

If *PD\_Spec\_Revision\_Major* is set to 3 or higher, this field shall be set to 2 (Revision 3).

If *USB4\_Supported* is set to YES, then this field shall be set to 2 (Revision 3).

### USB\_Comms\_Capable (Y/N)

Is the Qualifying Product capable of enumerating as a USB host or device?

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

If *USB4\_Supported* is set to YES, then this field shall be set to YES.

*Note: This field represents bits in more than one message. It is important that all messages give the same value for these bits.*

### DR\_Swap\_To\_DFP\_Supported (Y/N)

Set to YES if Qualifying Product can respond with an **Accept** to a **DR\_Swap** request to switch from a UFP to a DFP.

If *Type\_C\_State\_Machine* is set to DRP and *Type\_C\_Can\_Act\_As\_Host* is set to YES and *Type\_C\_Can\_Act\_As\_Device* is set to NO then this field shall be set to YES.

If *Type\_C\_State\_Machine* is set to SNK and either *Type\_C\_Can\_Act\_As\_Host* or *Type\_C\_Is\_Alt\_Mode\_Controller* is set to YES, then this field shall be set to YES.

If *Type\_C\_State\_Machine* is set to SRC and *Type\_C\_Can\_Act\_As\_Device* is set to YES, then this field shall be set to YES.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

If *USB4\_DFP\_Supported* is set to YES and *Type\_C\_Port\_On\_Hub* is set to NO, then this field shall be set to YES.

*Note: This field represents bits in more than one message. It is important that all messages give the same value for these bits.*

### DR\_Swap\_To\_UFP\_Supported (Y/N)

Set to YES if Qualifying Product can respond with an **Accept** to a **DR\_Swap** request to switch from a DFP to a UFP.



If *Type\_C\_State\_Machine* is set to DRP and *Type\_C\_Can\_Act\_As\_Device* is set to YES and *Type\_C\_Can\_Act\_As\_Host* is set to NO then this field shall be set to YES.

If *Type\_C\_State\_Machine* is set to SNK and either *Type\_C\_Can\_Act\_As\_Host* or *Type\_C\_Is\_Alt\_Mode\_Controller* is set to YES, then this field shall be set to YES.

If *Type\_C\_State\_Machine* is set to SRC and *Type\_C\_Can\_Act\_As\_Device* is set to YES, then this field shall be set to YES.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

*Note: This field represents bits in more than one message. It is important that all messages give the same value for these bits.*

#### Unconstrained\_Power (Y/N)

Set this field to YES if either the Qualifying Product has an external power source available that is sufficient to adequately power the system while charging external devices or the Qualifying Product's primary function is to charge external devices.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

*Note: This field represents bits in more than one message. It is important that all messages give the same value for these bits.*

#### VCONN\_Swap\_To\_On\_Supported (Y/N)

Set to YES if Qualifying Product can respond with an **Accept** to a **VCONN\_Swap** message requesting it to start sourcing VCONN.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

#### VCONN\_Swap\_To\_Off\_Supported (Y/N)

Set to YES if Qualifying Product can respond with an **Accept** to a **VCONN\_Swap** message requesting it to stop sourcing VCONN.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

If *Type\_C\_Sources\_VCONN* is set to YES, then this field shall be set to YES.

#### Responds\_To\_Discov\_SOP\_UFP (Y/N)

Set to YES if the Qualifying Product can respond successfully to a **Discover Identity** command from its port partner using SOP when acting as an Upstream Facing Port.

- If this field is set to YES, then the Qualifying Product should respond to a **Discover Identity** command with an ACK.

- If this field is set to NO and *Responds\_To\_Discov\_SOP\_DFP* is set to YES, then the Qualifying Product should respond to a **Discover Identity** command with an NAK.
- If this field is set to NO and *Responds\_To\_Discov\_SOP\_DFP* is set to NO, then the Qualifying Product should ignore a **Discover Identity** command if *PD\_Specification\_Revision* is set to 1 (Revision 2) and should respond with **Not\_Supported** if *PD\_Specification\_Revision* is set to 2 (Revision 3).

If *USB4\_UFP\_Supported* is set to YES, then this field shall be set to YES.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

#### **Responds\_To\_Discov\_SOP\_DFP (Y/N)**

Set to YES if the Qualifying Product can respond successfully to a **Discover Identity** command from its port partner using SOP when acting as a Downstream Facing Port.

- If this field is set to YES, then the Qualifying Product should respond to a **Discover Identity** command with an ACK.
- If this field is set to NO and *Responds\_To\_Discov\_SOP\_UFP* is set to YES, then the Qualifying Product should respond to a **Discover Identity** command with an NAK.
- If this field is set to NO and *Responds\_To\_Discov\_SOP\_UFP* is set to NO, then the Qualifying Product should ignore a **Discover Identity** command if *PD\_Specification\_Revision* is set to 1 (Revision 2) and should respond with **Not\_Supported** if *PD\_Specification\_Revision* is set to 2 (Revision 3).

If this Component is a **USB4 DFP**, then this field shall be set to YES.

If the Complete PD Specification Number is greater than or equal to 3020h, and the Qualifying Product has more than one port on which *Product\_Type\_DFP\_SOP* is set to any of 1 (PDUSB Hub), 2 (PDUSB Host), or 3 (Power Brick), then this field shall be set to YES.

If *USB4\_DFP\_Supported* is set to YES, then this field shall be set to YES.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

#### **Attempts\_Discov\_SOP (Y/N)**

Set to YES if the Qualifying Product can send a **Discover Identity** command to its port partner using SOP. Set to NO otherwise.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

If *USB4\_DFP\_Supported* is set to YES, then this field shall be set to YES.

### Chunking\_Implemented\_SOP (Y/N)

Does this Qualifying Product implement an extended message chunking layer, as defined in Chapter 6 of *[PowerDelivery3.0]*?

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

### Unchunked\_Extended\_Messages\_Supported (Y/N)

Does this Qualifying Product set the Unchunked Extended Messages Supported bit, as defined in Chapter 6 of *[PowerDelivery3.0]*?

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

### Manufacturer\_Info\_Supported\_Port (Y/N)

Is the *Get\_Manufacturer\_Info* request (with Manufacturer Info Target set to 0), supported by this Component?

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

### Manufacturer\_Info\_VID\_Port

The Vendor ID, as assigned by USB-IF.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

If *Manufacturer\_Info\_Supported\_Port* is not set to YES, then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

This field shall take the same value as *Product\_VID*.

### Manufacturer\_Info\_PID\_Port

The Product ID, as assigned by the vendor.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

If *Manufacturer\_Info\_Supported\_Port* is not set to YES, then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

#### Security\_Msgs\_Supported\_SOP (Y/N)

Set to YES if the Qualifying Product responds to a **Security\_Request** message with a **Security\_Response** message.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), then this field shall be ignored by Testers.

#### Num\_Fixed\_Batteries

The number of non-removable batteries in the device of which the Qualifying Product is a part.

Valid values are in the range 0 - 4.

If *Port\_Battery\_Powered* is set to YES, then at least one of this field and *Num\_Swappable\_Battery\_Slots* shall be non-zero.

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

This field shall be the same for all Components for which it is required.

#### Num\_Swappable\_Battery\_Slots

The number of slots for removable batteries in the device of which the Qualifying Product is a part.

Valid values are in the range 0 - 4.

If *Port\_Battery\_Powered* is set to YES, then at least one of this field and *Num\_Fixed\_Batteries* shall be non-zero.

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker) then this field shall be ignored by Testers.

This field shall be the same for all Components for which it is required.

### ID\_Header\_Connector\_Type\_SOP

Is this connector a plug or a receptacle?

Valid options are:

- 2 - USB Type-C Receptacle
- 3 - USB Type-C Plug

If *VIF\_Product\_Type* is not set to 0 (Port Product), this field shall be ignored by Testers.

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### 3.2.4.1 SOP\* Capabilities

For the SOP\* capability fields described below, the requirement is to answer YES if the Qualifying Product will return a **GoodCRC** for a message in the appropriate SOP\* type, under the conditions of the test, when it is appropriate. Typically, *SOP\_P\_Capable* and *SOP\_PP\_Capable* will not be responded to by a UFP with a contract. During testing this is the assumed condition. If they respond to SOP' and/or SOP'' as a DFP then the question should be answered YES.

#### SOP\_Capable (Y/N)

Does the Qualifying Product support the SOP protocol?

If *VIF\_Product\_Type* is set to 1 (Cable) or *PD\_Port\_Type* is set to 5 (eMarker), then this field shall be set to NO.

If *VIF\_Product\_Type* is set to 0 (Port Product) and *PD\_Port\_Type* is not set to 5 (eMarker), then this field shall be set to YES.

#### SOP\_P\_Capable (Y/N)

Does the Qualifying Product support the SOP' protocol?

If *PD\_Port\_Type* is set to 5 (eMarker), then this field shall be set to YES.

If *USB4\_DFP\_Supported* is YES then this field shall be set to YES.

If *VIF\_Product\_Type* is set to 1 (Cable), then this field shall be set to YES.

#### SOP\_PP\_Capable (Y/N)

Does the Qualifying Product support the SOP'' protocol?

If *SOP\_P\_Capable* is not set to YES, then this field shall be ignored by Testers.

If *PD\_Port\_Type* is set to 5 (eMarker), then this field shall be set to NO.

If *USB4\_DFP\_Supported* is YES then this field shall be set to YES.

#### SOP\_P\_Debug\_Capable (Y/N)

Does the Qualifying Product support the SOP'\_Debug protocol?

#### SOP\_PP\_Debug\_Capable (Y/N)

Does the Qualifying Product support the SOP''\_Debug protocol?

### 3.2.5 USB Type-C Fields

The fields in this section shall be ignored by Testers if *Connector\_Type* is not set to 2 (Type-C) or if *VIF\_Product\_Type* is not set to 0 (Port Product).

#### Type\_C\_Implements\_Try\_SRC (Y/N)

Indicates whether this Component supports the Try.SRC state when transitioning out of AttachWait.SNK.

At most one of *Type\_C\_Implements\_Try\_SRC* and *Type\_C\_Implements\_Try\_SNK* may be set to YES.

If *Type\_C\_State\_Machine* is not set to 2 (DRP) then this field shall be ignored by Testers.

#### Type\_C\_Implements\_Try\_SNK (Y/N)

Indicates whether this Component supports the Try.SNK state when transitioning out of AttachWait.SRC.

At most one of *Type\_C\_Implements\_Try\_SRC* and *Type\_C\_Implements\_Try\_SNK* may be set to YES.

If *Type\_C\_State\_Machine* is not set to 2 (DRP) then this field shall be ignored by Testers.

#### RP\_Value

Indicates what Rp value a source port presents upon connect.

Valid options are:

- 0 - Default
- 1 - 1.5A
- 2 - 3A

If *Type\_C\_State\_Machine* is not set to 0 (SRC) or 2 (DRP) then this field shall be ignored by Testers.

#### Type\_C\_Supports\_VCONN\_Powered\_Accessory (Y/N)

Indicates whether the non-source port supports communication with a Vconn Powered Accessory.

If *PD\_Port\_Type* is not set to 0 (Consumer Only), then this field shall be ignored by Testers.

#### Type\_C\_Is\_VCONN\_Powered\_Accessory (Y/N)

Indicates whether this Component is a Vconn Powered Accessory.

If *PD\_Port\_Type* is set to 3 (Provider), then this field shall be ignored by Testers.

If *PD\_Port\_Type* is set to 5 (eMarker), then this field shall be set to NO.

#### Type\_C\_Is\_Debug\_Target\_SRC (Y/N)

Indicates whether this Component supports the UnorientedDebugAccessory.SRC state and optionally the OrientedDebugAccessory.SRC state.

If *Type\_C\_State\_Machine* is not set to 0 (SRC) or 2 (DRP) then this field shall be ignored by Testers.

#### Type\_C\_Is\_Debug\_Target\_SNK (Y/N)

Indicates whether this Component supports the DebugAccessory.SNK state.

If *Type\_C\_State\_Machine* is not set to 1 (SNK) or 2 (DRP) then this field shall be ignored by Testers.

#### Type\_C\_Can\_Act\_As\_Host (Y/N)

Indicates whether this Component can communicate with USB 2.0 or USB 3.2 as a host or as the Downstream Facing Port of a hub.

If *USB\_Comms\_Capable* is set to NO, then this field shall be set to NO.

If *USB\_Comms\_Capable* is set to YES and *Type\_C\_Can\_Act\_As\_Device* is set to NO, then this field shall be set to YES.

If *USB\_PD\_Support* is not set to YES and *Type\_C\_State\_Machine* is set to 1 (SNK), then this field shall be set to NO.

If *PD\_Port\_Type* is set to 5 (eMarker), then this field shall be set to NO.

If *USB4\_DFP\_Supported* is set to YES, then this field shall be set to YES.

The Qualifying Product shall have no more than one field in which *USB\_Comms\_Capable* is set to YES and this field is set to NO.

#### Type\_C\_Is\_Alt\_Mode\_Controller (Y/N)

Can this Component act as an Alternate Mode Controller?

If *USB\_PD\_Support* is not set to YES, then this field shall be ignored by Testers.

If *PD\_Port\_Type* is set to 5 (eMarker), then this field shall be set to NO.

#### Type\_C\_Can\_Act\_As\_Device (Y/N)

Indicates whether this Component can communicate with USB 2.0 or USB 3.2 as a device or as the Upstream Facing Port of a hub.

If *USB\_Comms\_Capable* is set to NO, then this field shall be set to NO.

If *USB\_Comms\_Capable* is set to YES and *Type\_C\_Can\_Act\_As\_Host* is set to NO, then this field shall be set to YES.

If *PD\_Port\_Type* is set to 5 (eMarker), then this field shall be set to YES.

If *USB\_PD\_Support* is not set to YES and *Type\_C\_State\_Machine* is set to 0 (SRC), then this field shall be set to NO.

If *USB4\_UFP\_Supported* is set to YES, then this field shall be set to YES.

#### Type\_C\_Is\_Alt\_Mode\_Adapter (Y/N)

Can this Component act as an Alternate Mode Device?

If *USB\_PD\_Support* is not set to YES, then this field shall be ignored by Testers.

If *Type\_C\_Can\_Act\_As\_Device* is not set to YES, then this field shall be ignored by Testers.

If *Responds\_To\_Discov\_SOP\_UFP* is not set to YES, then this field shall be set to NO.

#### Type\_C\_Power\_Source

Indicates whether this Component is powered externally, through the Upstream Facing Port, or either ("Both").

Valid options are:

- 0 - Externally Powered
- 1 - UFP-powered
- 2 - Both

#### Type\_C\_Port\_On\_Hub (Y/N)

Is this Component part of a PDUSB Hub?

If *PD\_Port\_Type* is set to 5 (eMarker), then this field shall be set to NO.

#### Type\_C\_Supports\_Audio\_Accessory (Y/N)

Does this Component support communication with an Audio Accessory?

#### Type\_C\_Sources\_VCONN (Y/N)

Indicates whether this Component sources Vconn.

If *VCONN\_Swap\_To\_On\_Supported* is set to YES, then this field shall be set to YES.

This field and *Captive\_Cable* shall not both be set to YES.

If *PD\_Port\_Type* is set to 5 (eMarker), then this field shall be set to NO.

### 3.2.6 USB4 Port Fields

The fields in this section shall be ignored by Testers unless *USB4\_Supported* is set to YES.



#### USB4\_Lane\_0\_Adapter

The Adapter number of the Lane 0 Adapter associated with this Component.

Valid values are in the range 1 - 62.

#### USB4\_Max\_Speed

Indicates the maximum supported USB4 speed.

Valid options are:

0 - Gen 2 (20Gb)

1 - Gen 3 (40Gb)

**USB4 Hubs** shall set this field to 1 (Gen 3 (40Gb)).

#### USB4\_DFP\_Supported (Y/N)

Can this Component act as a Downstream Facing Port as specified in **[USB4]**?

If *USB4\_UFP\_Supported* is set to NO, then this field shall be set to YES.

If *Type\_C\_Can\_Act\_As\_Host* is set to NO, then this field shall be set to NO.

#### USB4\_UFP\_Supported (Y/N)

Can this Component act as an Upstream Facing Port as specified in **[USB4]**?

If *USB4\_DFP\_Supported* is set to NO, then this field shall be set to YES.

The Qualifying Product shall not have more than one port on which *USB4\_DFP\_Supported* is set to NO and this field is set to YES.

If *Type\_C\_Can\_Act\_As\_Device* is set to NO, then this field shall be set to NO.

#### USB4\_USB3\_Tunneling\_Supported (Y/N)

Does this Component support USB3 Tunneling?

If the Qualifying Product is a **USB4 Host** or a **USB4 Hub**, then this field shall be set to YES.

#### USB4\_DP\_Tunneling\_Supported (Y/N)

Does this Component support DisplayPort Tunneling?

If the Qualifying Product is a **USB4 Host** or a **USB4 Hub**, then this field shall be set to YES.

#### USB4\_PCIE\_Tunneling\_Supported (Y/N)

Does this Component support PCIe Tunneling?

If the Qualifying Product is a **USB4 Hub**, then this field shall be set to YES.

#### USB4\_TBT3\_Compatibility\_Supported (Y/N)

Does this field support Thunderbolt 3?

If the Qualifying Product is a **USB4 Hub** then this field shall be set to YES on all **USB4 DFPs**.

If the Qualifying Product is a **USB4 Dock**, then this field shall be set to YES.

#### USB4\_CL1\_State\_Supported (Y/N)

Does this Component support the CL1 low power state?

#### USB4\_CL2\_State\_Supported (Y/N)

Does this Component support the CL1 low power state?

#### USB4\_Num\_Retimers

The number of On-Board re-timers between Router and connector.

Valid values are in the range 0 - 2.

#### USB4\_DP\_Bit\_Rate

The Main-Link bit rate as defined in DP 1.4a specification.

Valid options are:

- 0 - RBR
- 1 - HBR
- 2 - HBR2
- 3 - HBR3

If *USB4\_DP\_Tunneling\_Supported* is not set to YES, then this field shall be ignored by Testers.

#### USB4\_Num\_DP\_Lanes

The number of Lanes that support Native DP traffic.

Valid options are:

- 1 - 1 lane
- 2 - 2 lanes
- 4 - 4 lanes

If *USB4\_DP\_Tunneling\_Supported* is not set to YES, then this field shall be ignored by Testers.

### 3.2.7 USB4 Product Fields

Unless otherwise specified, fields in this section shall be ignored by Testers unless *USB4\_Supported* is set to YES.

#### USB4\_Dock (Y/N)

Is the Qualifying Product a Dock as specified in **[USB4]**?

If the Qualifying Product is not a **USB4 Hub**, then this field shall be ignored by Testers.

#### USB4\_Num\_Internal\_Host\_Controllers

The number of Internal Host Controllers that the Qualifying Product contains.

Valid values are in the range 0 - 4.

If the Qualifying Product does not contain a **USB4 Port**, then this field shall be ignored by Testers.

If the Qualifying Product is a **USB4 Host** or a **USB4 Dock**, then this field shall be greater than 0.

#### USB4\_Num\_PCIE\_DN\_Bridges

The number of PCIe downstream bridges in the product that connect to a PCIe Adapter, a Native PCIe device or internal PCIe device.

Valid values are in the range 0 - 63.

This field shall be set to 0 unless the Qualifying Product has at least one **USB4 Port** on which **USB4\_PCIE\_Tunneling\_Supported** is set to YES.

If the Qualifying Product does not contain a **USB4 Port**, then this field shall be ignored by Testers.

### 3.2.7.1 USB4 Device Class Fallback Support

If the Qualifying Product is not a **USB4 Peripheral** or a **USB4 Dock** then the fields in this section shall be ignored by Testers.

#### USB4\_Audio\_Supported (Y/N)

Does the Product implement the USB Audio Class when operating over USB 3.2 or USB 2?

#### USB4\_HID\_Supported (Y/N)

Does the Product implement the USB Human Interface Device (HID) Class when operating over USB 3.2 or USB 2?

#### USB4\_Printer\_Supported (Y/N)

Does the Product implement the USB Printer Class when operating over USB 3.2 or USB 2?

#### USB4\_Mass\_Storage\_Supported (Y/N)

Does the Product implement the USB Mass Storage Class when operating over USB 3.2 or USB 2?

#### USB4\_Video\_Supported (Y/N)

Does the Product implement the USB Video (UVC) Class when operating over USB 3.2 or USB 2?

#### USB4\_Comms\_Networking\_Supported (Y/N)

Does the Product implement the USB Comms/Networking Class when operating over USB 3.2 or USB 2?

#### USB4\_Media\_Transfer\_Protocol\_Supported (Y/N)

Does the Product implement the USB Media Transfer Protocol Class when operating over USB 3.2 or USB 2?

#### USB4\_Smart\_Card\_Supported (Y/N)

Does the Product implement the USB Smart Card Class when operating over USB 3.2 or USB 2?

#### USB4\_Still\_Image\_Capture\_Supported (Y/N)

Does the Product implement the USB Still Image Capture Class when operating over USB 3.2 or USB 2?

#### USB4\_Monitor\_Device\_Supported (Y/N)

Does the Product implement the USB Monitor Class when operating over USB 3.2 or USB 2?

### 3.2.7.2 USB4 Router Fields

Unless otherwise specified, the fields in this section shall be ignored by Testers if the Qualifying Product does not contain a **USB4 Port**,

Index numbers shall start at 0, and shall be incremented by 1 for each router. A Qualifying Product shall have no more than 16 USB4 Routers.

#### USB4\_Router\_ID<X>

Index number assigned to uniquely identify Router within the product.

Valid values are in the range 0 - 15 and shall be less than the number of Routers in the Qualifying Product.

#### USB4\_Silicon\_VID<X>

The Vendor Identification Number (VID) of the Vendor providing the silicon for the Router.  
This value is assigned by USB-IF to the silicon vendor.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

#### USB4\_Num\_Lane\_Adapters<X>

The total number of Lane Adapters on the Router.

Valid values are in the range 2 - 62.

This field shall be greater than or equal to the number of **USB4 Ports associated with this Router** multiplied by 2.

#### USB4\_Num\_USB3\_DN\_Adapters<X>

The number of Downstream USB3 Adapters on the Router.

Valid values are in the range 1 - 63.

If the Qualifying Product is not a **USB4 Host** or a **USB4 Hub**, then this field shall be ignored by Testers.

#### USB4\_Num\_DP\_IN\_Adapters<X>

The number of DisplayPort IN Adapters on the Router.

Valid values are in the range 0 - 63.

If the Qualifying Product is a **USB4 Host**, then the sum of this field over all routers shall be greater than 0.

If the Qualifying Product is a **USB4 Peripheral** that supports DP Tunneling (**USB4\_DP\_Tunneling\_Supported** is set to YES on its **USB4 UFP** and the **USB4 UFP** is **associated with this Router**), then at least one of this field and **USB4\_Num\_DP\_OUT\_Adapters<X>** shall be greater than 0.

#### USB4\_Num\_DP\_OUT\_Adapters<X>

The number of DisplayPort OUT Adapters on the Router.

Valid values are in the range 0 - 63.

**USB4 Hubs** shall not set this field to 0.

If the Qualifying Product is a **USB4 Peripheral** that supports DP Tunneling (**USB4\_DP\_Tunneling\_Supported** is set to YES on its **USB4 UFP**) and the **USB4 UFP** is **associated with this Router**), then at least one of this field and **USB4\_Num\_DP\_IN\_Adapters<X>** shall be greater than 0.

#### USB4\_Num\_PCl\_e\_DN\_Adapters<X>

The number of PCIe Downstream Adapters on the Router.

Valid values are in the range 0 - 63.

If *USB4\_PCl\_e\_Tunneling\_Supported* is set to YES a **USB4 Port associated with this Router**, then this field shall be greater than 0.

#### USB4\_TBT3\_Not\_Supported<X>

Indicates whether the product has one or more Thunderbolt 3-compatible Ports on this Router.

Valid options are:

- 0 - TBT3-Compatible
- 1 - Not TBT3-Compatible

This field shall be set to 0 (TBT3-Compatible) if *USB4\_TBT3\_Compatibility\_Supported* is set to YES on any **USB4 Port associated with this Router**.

This field shall be set to 1 (Not TBT3-Compatible) if *USB4\_TBT3\_Compatibility\_Supported* is not set to YES on any **USB4 Port associated with this Router**.

*Note: the field name and option values are chosen to correspond to the base specification—refer to [USB4], table 8-3.*

#### USB4\_PCl\_e\_Wake\_Supported<X> (Y/N)

Does the Qualifying Product support PCIe Wake?

This field shall be set to NO if *USB4\_Num\_PCl\_e\_DN\_Adapters<X>* is set to 0.

#### USB4\_USB3\_Wake\_Supported<X> (Y/N)

Does the Qualifying Product support USB3 Wake?

If the Qualifying Product does not support USB3 tunneling on the Router (*USB4\_USB3\_Tunneling\_Supported* is set to NO on all **USB4 Ports associated with this Router**), then this field shall be set to NO

#### USB4\_Num\_Unused\_Adapters<X>

The number of Adapters in the Router that are not wired to a USB-C Connector.

Valid values are in the range 0 - 63.

#### USB4\_TBT3\_VID<X>

The Thunderbolt 3 Vendor ID (VID), assigned by Intel.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

If *USB4\_TBT3\_Not\_Supported<X>* is not set to 0 (TBT3-Compatible), then this field shall be ignored by Testers.

#### *USB4\_PCl\_e\_Switch\_Vendor\_ID<X>*

Vendor ID of PCIe switch connected to Router. This value is assigned by PCIe SIG.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

This field shall be ignored by Testers if *USB4\_Num\_PCl\_e\_DN\_Adapters<X>* is set to 0.

#### *USB4\_PCl\_e\_Switch\_Device\_ID<X>*

Device ID of PCIe switch connected to Router. This value is assigned by the vendor.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

This field shall be ignored by Testers if *USB4\_Num\_PCl\_e\_DN\_Adapters<X>* is set to 0.

#### *USB4\_Num\_PCl\_e\_Endpoints<X>*

The number of PCIe endpoints connected to Router. This includes endpoints for the internal PCIe device and any other embedded PCIe devices.

Valid values are in the range 1 - 64.

This field shall be ignored by Testers if the Qualifying Product is not a **USB4 Dock** or **USB4 Peripheral**.

This field shall be ignored by Testers if *USB4\_Num\_PCl\_e\_DN\_Adapters<X>* is set to 0.

### 3.2.7.3 PCIe Endpoint Fields

In this section, the fields represent the parameters for a single PCIe Endpoint. <Y> shall be an integer in the range 1 - the value of *USB4\_Num\_PCl\_e\_Endpoints<X>*. If <Y> is not given, or if <Y> falls outside the specified range, then the field is ignored by Testers.

Fields in this section shall be ignored by Testers if the Qualifying Product is not a **USB4 Dock** or **USB4 Peripheral**.

Fields in this section shall be ignored by Testers if *USB4\_Num\_PCl\_e\_DN\_Adapters<X>* is set to 0.

#### *USB4\_PCl\_e\_Endpoint<X>\_Vendor\_ID<Y>*

The Vendor ID of the PCIe endpoint. This value is assigned by PCIe SIG.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

#### *USB4\_PCl\_e\_Endpoint<X>\_Device\_ID<Y>*

The Device ID of the PCIe endpoint. This value is assigned by the vendor.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

#### USB4\_PCl\_e\_Endpoint<X>\_Class\_Code<Y>

The PCIe Class Code of the PCIe endpoint.

This field is a 6-digit hexadecimal number, with valid values in the range 0 - FFFFFFFh (0 - 16777215).

### 3.2.8 USB Data – Upstream Facing Port Fields

The fields in this section shall be ignored by Testers unless *Connector\_Type* is set to 1 (Type-B) or 3 (Micro A/B), or *Connector\_Type* is set to 2 (Type-C) and *Type\_C\_Can\_Act\_As\_Device* is set to YES.

The fields in this section shall only be set for a single port on a Qualifying Product.

#### Device\_Supports\_USB\_Data (Y/N)

Indicates whether this Component can act as a USB Data Upstream Facing Port.

If *Connector\_Type* is not set to 3 (Micro-A/B), then this field shall be set to YES.

#### Device\_Speed

Indicates the maximum USB speed supported when communicating as a USB2 or USB3.2 device.

Valid options are:

- 0 - USB 2
- 1 - USB 3.2 Gen 1x1
- 2 - USB 3.2 Gen 2x1
- 3 - USB 3.2 Gen 1x2
- 4 - USB 3.2 Gen 2x2

If *Connector\_Type* is set to 3 (Micro-A/B), then this field shall be set to 0 (USB 2).

If *Device\_Supports\_USB\_Data* is set to NO, then this field shall be ignored by Testers.

#### Device\_Contains\_Captive\_Retimer (Y/N)

Does this Component have an associated re-timer?

If *Device\_Supports\_USB\_Data* is set to NO, then this field shall be ignored by Testers.

#### Device\_Truncates\_DP\_For\_tDHPResponse (Y/N)

When communicating as a device, does this Component truncate Data Packets in order to meet the timing requirements for tDHPResponse?

If *Device\_Speed* is not set in the range 1 - 4 (any USB 3.2 Gen XxY), then this field shall be ignored by Testers.



If *Device\_Supports\_USB\_Data* is set to NO, then this field shall be ignored by Testers.

#### Device\_Gen1x1\_tLinkTurnaround

tLinkTurnaround is defined as the quantity  $tDHPResponse - tDPacket$ , where *tDHPResponse* and *tDPacket* are as defined in **[USB3.2]**. When communicating as a device operating at gen1x1, valid values are in the range 400ns - 1500ns.

If *Device\_Speed* is set to 0 (USB 2) or *Device\_Truncates\_DP\_For\_tDHPResponse* is not set to YES, then this field shall be ignored by Testers.

#### Device\_Gen2x1\_tLinkTurnaround

tLinkTurnaround is defined as the quantity  $tDHPResponse - tDPacket$ , where *tDHPResponse* and *tDPacket* are as defined in **[USB3.2]**. When communicating as a device operating at gen2x1, valid values are in the range 700ns - 1500ns.

If *Device\_Speed* is not set to 2 (USB 3.2 Gen 2x1) or 4 (USB 3.2 Gen 2x2) or *Device\_Truncates\_DP\_For\_tDHPResponse* is not set to YES, then this field shall be ignored by Testers.

### 3.2.9 USB Data – Downstream Facing Port Fields

The fields in this section shall be ignored by Testers unless *Connector\_Type* is set to 0 (Type-A) or 3 (Micro A/B); or *Connector\_Type* is set to 2 (Type-C) and *Type\_C\_Can\_Act\_As\_Host* is set to YES.

#### Host\_Supports\_USB\_Data (Y/N)

Indicates whether this Component can act as a USB Data Downstream Facing Port.

If *Connector\_Type* is not set to 0 (Type-A), then this field shall be set to YES.

If the Qualifying Product has no Components on which *Type\_C\_State\_Machine* is set to 0 (SRC) or 2 (DRP), then this field shall be set to YES.

#### Host\_Speed

Indicates the maximum USB speed supported when communicating as a USB2 or USB3.2 host or hub.

Valid options are:

- 0 - USB 2
- 1 - USB 3.2 Gen 1x1
- 2 - USB 3.2 Gen 2x1
- 3 - USB 3.2 Gen 1x2
- 4 - USB 3.2 Gen 2x2

If *Connector\_Type* is set to 3 (Micro-A/B), then this field shall be set to 0 (USB 2).

If *Host\_Supports\_USB\_Data* is not set to YES, then this field shall be ignored by Testers.

### Is\_DFP\_On\_Hub (Y/N)

Indicates whether this Component is a Downstream Facing Port of a USB Hub.

If *Connector\_Type* is set to 2 (Type-C), then this field shall be set to the value of *Type\_C\_Port\_On\_Hub*.

If the Qualifying Product has a Port on which *Connector\_Type* is set to 1 (Type-B), OR on which *Type\_C\_Can\_Act\_As\_Device* is set to YES and *Type\_C\_Can\_Act\_As\_Host* is set to NO, then this field shall be set to YES.

If *Host\_Supports\_USB\_Data* is not set to YES, then this field shall be ignored by Testers.

### Hub\_Port\_Number

The internal USB hub port number of this Component. This is the number that a USB Host uses to access this Component.

If *Host\_Speed* is set to 0 (USB 2), then valid values are in the range 1 - 255.

If *Host\_Speed* is set to any value in the range 1 - 4 (any USB 3.2 Gen XxY), then valid values are in the range 1 - 15.

If *Is\_DFP\_On\_Hub* is not set to YES, then this field shall be ignored by Testers.

### Host\_Contains\_Captive\_Retimer (Y/N)

Does this Component have an associated re-timer?

If *Host\_Supports\_USB\_Data* is not set to YES, then this field shall be ignored by Testers.

### Host\_Truncates\_DP\_For\_tDHPResponse (Y/N)

When communicating as a host, does this Component truncate Data Packets in order to meet the timing requirements for tDHPResponse?

If *Host\_Speed* is not set in the range 1 - 4 (any USB 3.2 Gen XxY) then this field shall be ignored by Testers.

If *Host\_Supports\_USB\_Data* is not set to YES, then this field shall be ignored by Testers.

### Host\_Gen1x1\_tLinkTurnaround

tLinkTurnaround is defined as the quantity  $tDHPResponse - tDPacket$ , where *tDHPResponse* and *tDPacket* are as defined in **[USB3.2]**. When communicating as a host operating at gen1x1, valid values are in the range 400ns - 1500ns.

If *Host\_Truncates\_DP\_For\_tDHPResponse* is not set to YES, then this field shall be ignored by Testers.

#### Host\_Gen2x1\_tLinkTurnaround

tLinkTurnaround is defined as the quantity  $tDHPResponse - tDPacket$ , where  $tDHPResponse$  and  $tDPacket$  are as defined in [\[USB3.2\]](#). When communicating as a host operating at gen2x1, valid values are in the range 700ns - 1500ns.

If *Host\_Speed* is not set to 2 (USB 3.2 Gen 2s1) or 4 (USB 3.2 Gen 2x2) or *Host\_Truncates\_DP\_For\_tDHPResponse* is not set to YES, then this field shall be ignored by Testers.

#### Host\_Is\_Embedded (Y/N)

Is this Component part of an embedded host?

This field shall be the same for all Components on which it is required.

If *Host\_Supports\_USB\_Data* is not set to YES, then this field shall be ignored by Testers.

#### Host\_Suspend\_Supported (Y/N)

Does the embedded host to which this Component belongs support USB Suspend?

If *Host\_Supports\_USB\_Data* is not set to YES, then this field shall be ignored by Testers.

If *Host\_Is\_Embedded* is set to NO, then this field shall be set to YES.

### 3.2.10 PD Source Fields

The fields in this section are required for all Ports on a Qualifying Products with Source capability (that is, *PD\_Port\_Type* is equal to one of 1 (Consumer/Provider), 2 (Provider/Consumer), 3 (Provider Only), or 4 (DRP)), and shall be ignored by Testers otherwise.

The first **Source\_Capabilities** message sent by the tester to a Sink will always be 5V at 100mA. The Qualifying Product is required to make a legal request for this (or for less current). At the same time the Capability Mismatch bit may be set. Any Qualifying Product requesting more than the Tester offered Source Capabilities will automatically fail, and no further testing will be performed.

#### PD\_Power\_As\_Source

An ECR to the V2.0 PD Specification has established a new set of Power Rules, superseding the earlier Profile Rules. The vendor of a Source Capable device shall specify a PD\_Power level (PDP) in mW. This is used by the Tester in conjunction with the Normative Voltages and Currents Table to determine the capabilities which may be offered by the Source.

Valid values are in the range 500 - 100000, where value shall be exactly divisible by 500 if it is less than 10000, and shall be exactly divisible by 1000 if it is greater than 10000.

If a value is less than 10000 mW, it shall be rounded down to the nearest 500 by Testers. If a value is greater than 10000 mW, it shall be rounded down to the nearest 1000 by Testers.

### USB\_Suspend\_May\_Be\_Cleared (Y/N)

In **Source\_Capabilities** there is a bit called **USB Suspend Supported**, which is normally set to one, but may be cleared to 0 to signal to the sink that the sink need not obey USB Suspend.

If the Qualifying Product (as a Source) will ever set **USB Suspend Supported** to a 0, then the VIF shall set this field to YES. Otherwise it should be set to NO.

### Sends\_Pings (Y/N)

Set to YES if Qualifying Product sends Ping messages when operating as a source. Sending Ping messages is optional (and unnecessary when communicating over a USB Type-C cable).

### FR\_Swap\_Type\_C\_Current\_Capability\_As\_Initial\_Sink

In what way does the Qualifying Product support Fast Role Swap when in initial Source role.

Valid options are:

- 0 - FR\_Swap not supported
- 1 - Default USB Power
- 2 - 1.5A @ 5V
- 3 - 3A @ 5V

If *PD\_Specification\_Revision* is set to 1 (Revision 2) then this field shall be ignored by Testers.

### Master\_Port (Y/N)

Set to YES if this Component is a Master Port as defined in **[USBType-C2.0]**. A Master Port is one which, on receipt of a BIST Message with a BIST Shared Test Mode Entry BIST Data Object, enters the BIST Shared Capacity Test Mode.

If *PD\_Specification\_Revision* is set to 1 (Revision 2) then this field shall be ignored by Testers.

### Num\_Src\_PDOs

The number of Power Data Objects (PDOs) sent in a **Source\_Capabilities** message. This field shall match the number of Source PDOs declared for this Qualifying Product.

Valid values are in the range 1 - 7.

### PD\_OC\_Protection (Y/N)

Does the Qualifying Product support Over-Current Protection (OCP)?

If this Component supports USB Power Delivery, then it is required to support OCP. However, a Qualifying Product may set this field to NO in order to notify Testers that they have not yet implemented OCP and that Testers should not run tests that could harm it.

*Note: Testers may record a failure if a test is not run.*

### PD\_OCP\_Method

What method does the Qualifying Product use to implement OCP?

Valid options are:

- 0 – Over-Current Response
- 1 – Under-Voltage Response
- 2 – Both

If *PD\_OC\_Protection* is not set to YES, then this field shall be ignored by Testers.

### 3.2.10.1 Source PDOs

In this section, the fields represent the parameters for a single Source PDO. <X> shall be an integer in the range 1 - 7. If <X> is not given, or if <X> falls outside the specified range, then the field is ignored by Testers.

It is expected that PDO numbers <X> shall start at 1 and be incremented sequentially. If there is a gap in the sequence (e.g., PDOs 1, 2, and 4 exist, but PDO 3 does not), then behavior by Testers is unspecified.

### Src\_PDO\_Supply\_Type<X>

The type of this Source PDO.

Valid options are:

- 0 – Fixed
- 1 – Battery
- 2 – Variable (non-battery)
- 3 – PPS (if *PD\_Specification\_Revision* is set to 2 (Revision 3))

If <X> is equal to 1, then this field shall be set to 0 (Fixed).

### Src\_PDO\_Peak\_Current<X>

Peak current (that is, over the value specified by *Src\_PDO\_Voltage*<X>) that the Qualifying Product may provide for short periods.

Valid options are:

- 0 – 100% IOC
- 1 – 130% IOC
- 2 – 150% IOC
- 3 – 200% IOC

If *Src\_PDO\_Supply\_Type*<X> is not set to 0 (fixed), then this field shall be ignored by Testers.

### Src\_PDO\_Voltage<X>

Output voltage in units of 50 mV.

Valid values are in the range 0 - 400 (0 - 20000 mV).

If <X> is equal to 1, then this field shall be set to 100 (5000 mV).

If *Src\_PDO\_Supply\_Type*<X> is not set to 0 (fixed), then this field shall be ignored by Testers.

#### Src\_PDO\_Max\_Current<X>

If *Src\_PDO\_Supply\_Type*<X> is set to 0 (fixed), or 2 (Variable), then this field represents the maximum operating current in units of 10mA, with valid values in the range 0 - 500 (0 - 5000 mA).

If *Src\_PDO\_Supply\_Type*<X> is set to 3 (PPS), then this field represents the maximum operating current in units of 50mA, with valid values in the range 0 - 100 (0 - 5000 mA).

If *Src\_PDO\_Supply\_Type*<X> is not set to 0 (fixed), 2 (Variable), or 3 (PPS), then this field shall be ignored by Testers.

#### Src\_PDO\_Min\_Voltage<X>

If *Src\_PDO\_Supply\_Type*<X> is set to 1 (Battery) or 2 (Variable), this field represents the minimum output voltage in units of 50 mV with valid values in the range 0 - 420 (0 - 21000 mV).

If *Src\_PDO\_Supply\_Type*<X> is set to 3 (PPS), this field represents the minimum output voltage in units of 100 mV, with valid values in the range 0 - 210 (0 - 21000 mV).

In either case, this field shall be less than *Src\_PDO\_Max\_Voltage*<X>.

If *Src\_PDO\_Supply\_Type*<X> is not set to 1 (Battery), 2 (Variable), or 3 (PPS), then this field shall be ignored by Testers.

#### Src\_PDO\_Max\_Voltage<X>

If *Src\_PDO\_Supply\_Type*<X> is set to 1 (Battery) or 2 (Variable), this field represents the maximum output voltage in units of 50 mV, with valid values in the range 0 - 420 (0 - 21000 mV).

If *Src\_PDO\_Supply\_Type*<X> is set to 3 (PPS), this field represents the maximum output voltage in units of 100 mV, with valid values in the range 0 - 210 (0 - 21000 mV).

In either case, this field shall be greater than *Src\_PDO\_Min\_Voltage*<X>.

If *Src\_PDO\_Supply\_Type*<X> is not set to 1 (battery), 2 (Variable), or 3 (PPS), then this field shall be ignored by Testers.

#### Src\_PDO\_Max\_Power<X>

Power supplied in units of 250 mW.

Valid values are in the range 0 - 400 (0 - 100000 mW).

If *Src\_PDO\_Supply\_Type*<X> is not set to 1 (battery), then this field shall be ignored by Testers.

#### Src\_PD\_OCP\_OC\_Debounce<X>

The Over-Current debounce time in units of 1 mS.

Valid values are in the range 0 – 1000.

If *Src\_PDO\_Supply\_Type*<X> is not set to 0 (fixed), then this field shall be ignored by Testers.

If *PD\_OCP\_Method* is not set to 0 (Over-Current Response) or 2 (Both), then this field shall be ignored by Testers.

#### *Src\_PD\_OCP\_OC\_Threshold*<X>

The Over-Current threshold current in units of 10 mA.

Valid values are in the range *Src\_PDO\_Max\_Current*<X> to 1000 (10000 mA).

If *Src\_PDO\_Supply\_Type*<X> is not set to 0 (fixed), then this field shall be ignored by Testers.

If *PD\_OCP\_Method* is not set to 0 (Over-Current Response) or 2 (Both), then this field shall be ignored by Testers.

#### *Src\_PD\_OCP\_UV\_Debounce*<X>

The Under-Voltage debounce time in units of 1 mS.

Valid values are in the range 0 - 1000.

If *Src\_PDO\_Supply\_Type*<X> is not set to 0 (fixed), then this field shall be ignored by Testers.

If *PD\_OCP\_Method* is not set to 1 (Under-Voltage Response) or 2 (Both), then this field shall be ignored by Testers.

#### *Src\_PD\_OCP\_UV\_Threshold\_Type*<X>

What method should be used to determine the Under-Voltage threshold?

Valid options are:

0 – Value

1 – Percentage

If *Src\_PDO\_Supply\_Type*<X> is not set to 0 (fixed), then this field shall be ignored by Testers.

If *PD\_OCP\_Method* is not set to 1 (Under-Voltage Response) or 2 (Both), then this field shall be ignored by Testers.

#### *Src\_PD\_OCP\_UV\_Threshold*<X>

If *Src\_PD\_OCP\_UV\_Threshold\_Type*<X> is set to 0 (Value), then this field represents the Under-Voltage threshold expressed as an absolute voltage in units of 10 mV. Valid values are in the range 80 –  $V_{95}/10$  (800 –  $V_{95}$  mV), where  $V_{95}$  is 95% of *Src\_PDO\_Voltage*<X> in mV. Testers shall give 5% tolerance to the value entered.

If *Src\_PD\_OCP\_UV\_Threshold\_Type*<X> is set to 1 (Percentage), then this field represents Under-Voltage threshold expressed as the percentage of *Src\_PDO\_Voltage*<X>. Valid values are in the range 0 – 95. Testers shall give 5% tolerance to the value calculated.

If *Src\_PDO\_Supply\_Type*<X> is not set to 0 (fixed), then this field shall be ignored by Testers.

If *PD\_OCP\_Method* is not set to 1 (Under-Voltage Response) or 2 (Both), then this field shall be ignored by Testers.

### 3.2.11 PD Sink Fields

The fields in this section are required for all Ports on a Qualifying Products with Sink capability (that is, *PD\_Port\_Type* is equal to one of 0 (Consumer Only), 1 (Consumer/Provider), 2 (Provider/Consumer), or 4 (DRP)), and shall be ignored by Testers otherwise.

A Sink Qualifying Product will be offered 0mA at all voltages offered at least one point. This is a PD Suspend condition and a request for 0mA at one of the voltages offered is a mandatory requirement. Any Qualifying Product which does not request 0mA under these conditions will fail compliance.

#### PD\_Power\_As\_Sink

The vendor of a Sink Capable device shall specify a PD\_Power level (PDP) in mW. This is used by the Tester in conjunction with the Normative Voltages and Currents Table to determine the maximum capabilities which may be required by the Sink.

Valid values are in the range 0 - 100000, where value shall be exactly divisible by 500 if it is less than 10000 and shall be exactly divisible by 1000 if it is greater than 10000.

If a value is less than 10000 mW, it shall be rounded up to the nearest 500 by Testers. If a value is greater than 10000 mW, it shall be rounded up to the nearest 1000 by Testers.

#### No\_USB\_Suspend\_May\_Be\_Set (Y/N)

In a Request message there is a bit called **No USB Suspend**, which the Sink sets to one if it wishes to request that it need not obey USB Suspend, but instead be allowed to continue to draw power according to its PD contract.

If the Qualifying Product (as a Sink) will ever set **No USB Suspend** to a 1, then the VIF shall set this field to YES. Otherwise it should be set to NO.

#### GiveBack\_May\_Be\_Set (Y/N)

In a Request message there is a bit called **Giveback**, which the Sink sets to 1 if it is prepared to lower its Operating Current to its Minimum Operating Current, on demand.

If the Qualifying Product will ever set this bit in the test configuration, then it shall set this field to YES. Otherwise it should be set to NO.

#### Higher\_Capability\_Set (Y/N)

In a **Sink\_Capabilities** message there is a bit called **HigherCapability**, which the Sink sets to 1 if it needs more than **vSafe5V** (e.g. 12V) to provide full functionality.

If the Qualifying Product sets this bit in the configuration described by the VIF, then this field shall be set to YES, otherwise, to NO.



### FR\_Swap\_Reqd\_Type\_C\_Current\_As\_Initial\_Source

This field is used to determine if the Qualifying Product supports Fast Role Swap in initial Source role.

In a *Sink\_Capabilities* message there is a field called **Fast Role Swap USB Type-C Current**, in which the sink initial Source describes whether it supports Fast Role Swap as a new Sink, and if so, what current it requires as a new Sink.

Valid options are:

- 0 - FR\_Swap not supported
- 1 - Default USB Power
- 2 - 1.5A @ 5V
- 3 - 3A @ 5V

If *PD\_Specification\_Revision* is set to 1 (Revision 2) then this field shall be ignored by Testers.

### Num\_Snk\_PDOs

The number of Power Data Objects (PDOs) sent in a *Sink\_Capabilities* message. This field shall match the number of Sink PDOs declared for this Qualifying Product.

Valid values are in the range 1 - 7.

#### 3.2.11.1 Sink PDOs

In this section, the fields represent the parameters for a single Sink PDO. <X> shall be an integer in the range 1 - 7. If <X> is not given, or if <X> falls outside the specified range, then the field shall be ignored by Testers.

It is expected that PDO numbers <X> shall start at 1 and be incremented sequentially. If there is a gap in the sequence (e.g., PDOs 1, 2, and 4 exist, but PDO 3 does not), then behavior by Testers is unspecified.

### Snk\_PDO\_Supply\_Type<X>

The type of this Sink PDO.

Valid options are:

- 0 - Fixed
- 1 - Battery
- 2 - Variable (non-battery)
- 3 - PPS (if *PD\_Specification\_Revision* is set to 2 (Revision 3))

If <X> is equal to 1, then this field shall be set to 0 (Fixed).

### Snk\_PDO\_Voltage<X>

The voltage, in units of 50 mV, required for the device to operate at least one of its modes of operation.

Valid values are in the range 0 - 400 (0 - 20000 mV).

If <X> is equal to 1, then this field shall be set to 100 (5000 mV).

If *Snk\_PDO\_Supply\_Type*<X> is not equal to 0 (fixed), then this field shall be ignored by Testers.

#### *Snk\_PDO\_Op\_Current*<X>

If *Src\_PDO\_Supply\_Type*<X> is set to 0 (Fixed) or 2 (Variable), this field represents the operating current, in units of 10 mA, required for the device to operate at least one of its modes of operation, with valid values are in the range 0 - 500 (0 - 5000 mA).

If *Src\_PDO\_Supply\_Type*<X> is set to 3 (PPS), this field represents the operating current, in units of 50 mA, required for the device to operate at least one of its modes of operation, with valid values are 0 - 100 (0 - 5000 mA).

If *Snk\_PDO\_Supply\_Type*<X> is not equal to 0 (fixed), 2 (variable), or 3 (PPS) then this field shall be ignored by Testers.

#### *Snk\_PDO\_Op\_Power*<X>

Operating power, in units of 250 mW, required for the device to operate at least one of its modes of operation.

Valid values are in the range 0 - 400 (0 - 100000 mW).

If *Snk\_PDO\_Supply\_Type*<X> is not equal to 1 (battery), then this field shall be ignored by Testers.

#### *Snk\_PDO\_Min\_Voltage*<X>

If *Snk\_PDO\_Supply\_Type*<X> is set to 1 (Battery) or 2 (Variable), this field represents the minimum output voltage, in units of 50 mV, with valid values in the range 0 - 420 (0 - 21000 mV).

If *Snk\_PDO\_Supply\_Type*<X> is set to 3 (PPS), this field represents the minimum output voltage, in units of 100 mV, with valid values in the range 0 - 210 (0 - 21000 mV).

In either case, the absolute voltage, including any voltage variation, shall not fall below this value. This value shall be less than *Snk\_PDO\_Max\_Voltage*<X>.

If *Snk\_PDO\_Supply\_Type*<X> is not set to 1 (Battery), 2 (Variable), or 3 (PPS), then this field shall be ignored by Testers.

#### *Snk\_PDO\_Max\_Voltage*<X>

If *Snk\_PDO\_Supply\_Type*<X> is set to 1 (Battery) or 2 (Variable), this field represents the maximum output voltage in units of 50 mV, with valid values in the range 0 - 420 (0 - 21000 mV).

If *Snk\_PDO\_Supply\_Type*<X> is set to 3 (PPS), this field represents the maximum output voltage in units of 100 mV, with valid values in the range in the range 0 - 210 (0 - 21000 mV).

In either case, the absolute voltage, including any voltage variation, shall not exceed this value. This value shall be greater than *Snk\_PDO\_Min\_Voltage*<X>.

If *Snk\_PDO\_Supply\_Type*<X> is not set to 1 (Battery), 2 (Variable), or 3 (PPS), then this field shall be ignored by Testers.

### 3.2.12 PD Dual Role Fields

The fields in this section are required for all Ports on a Qualifying Products with both Source and Sink capability (that is, *PD\_Port\_Type* is equal to one of 1 (Consumer/Provider), 2 (Provider/Consumer), or 4 (DRP)), and shall be ignored by Testers otherwise.

#### Accepts\_PR\_Swap\_As\_Src (Y/N)

Set to YES if Port ever supports a **PR\_Swap** request while operating as a Source.

#### Accepts\_PR\_Swap\_As\_Snk (Y/N)

Set to YES if Port ever supports a **PR\_Swap** request while operating as a Sink.

#### Requests\_PR\_Swap\_As\_Src (Y/N)

Set to YES if the Qualifying Product may send a **PR\_Swap** request while operating as a Source.

#### Requests\_PR\_Swap\_As\_Snk (Y/N)

Set to YES if the Qualifying Product may send a **PR\_Swap** request while operating as a Sink.

#### FR\_Swap\_Supported\_As\_Initial\_Sink (Y/N)

This field is used to determine if the Qualifying Product supports Fast Role Swap in initial Sink role.

If *PD\_Specification\_Revision* is set to 1 (Revision 2) then this field shall be ignored by Testers.

### 3.2.13 SOP Discovery Fields

The fields in this section shall be ignored by Testers unless at least one of *Responds\_To\_Discov\_SOP\_UFP* and *Responds\_To\_Discov\_SOP\_DFP* is set to YES.

#### XID\_SOP

A decimal number assigned by USB-IF prior to certification.

Valid values are in the range 0 - 1048575.

### Data\_Capable\_As\_USB\_Host\_SOP (Y/N)

Indicates whether the Qualifying Product is capable of enumerating USB Devices.

This field shall be set to the same value as *Type\_C\_Can\_Act\_As\_Host*.

### Data\_Capable\_As\_USB\_Device\_SOP (Y/N)

Indicates whether the Qualifying Product is capable of enumerating as a USB Device.

This field shall be set to the same value as *Type\_C\_Can\_Act\_As\_Device*.

### Product\_Type\_UFP\_SOP

What is the product type of the Qualifying Product when acting as an Upstream Facing Port?

If *Type\_C\_Can\_Act\_As\_Device* is set to NO and *Type\_C\_State\_Machine* is set to 1 (SNK) or 2 (DRP) , then valid options are:

- 3 - PSD

If *Type\_C\_Can\_Act\_As\_Device* is set to NO and *Type\_C\_State\_Machine* is set to 0 (SRC), then valid options are:

- 0 - Undefined

If *Type\_C\_Can\_Act\_As\_Device* is set to YES and *Type\_C\_Is\_Alt\_Mode\_Adapter* is set to YES, then valid options are:

- 5 - Alternate Mode Adapter (AMA)

If *Type\_C\_Can\_Act\_As\_Device* is set to YES and *Type\_C\_Is\_Alt\_Mode\_Adapter* is not set to YES, then valid options are:

- 1 - PDUSB Hub
- 2 - PDUSB Peripheral

### Product\_Type\_DFP\_SOP

What is the product type of the Qualifying Product when acting as a Downstream Facing Port?

If *Type\_C\_Can\_Act\_As\_Host* is set to YES and *Type\_C\_Is\_Alt\_Mode\_Controller* is set to YES, then valid options are:

- 4 - Alternate Mode Controller (AMC)

If *Type\_C\_Is\_Alt\_Mode\_Controller* is set to NO, then valid options are:

- 0 - Undefined
- 1 - PDUSB Hub
- 2 - PDUSB Host
- 3 - Power Brick

In all other cases, valid options are:

- 0 - Undefined
- 1 - PDUSB Hub
- 2 - PDUSB Host
- 3 - Power Brick
- 4 - Alternate Mode Controller (AMC)

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), then this field shall be ignored by Testers.

### DFP\_VDO\_Port\_Number

The Port Number for this Component as given in the DFP VDO.

This field shall be unique to each Component for which it is required.

This field shall have the same value as *Port\_Label*.

*Note: this field is independent of the Port Number field defined in [USB2.0] and [USB3.2] or in the EHCI or xHCI USB Host Controller specifications.*

If *Responds\_To\_Discov\_SOP\_DFP* is not set to YES, then this field shall be ignored by Testers.

If *USB4\_Supported* is not set to YES, then this field shall be ignored by Testers.

### Modal\_Operation\_Supported\_SOP (Y/N)

Does the product support Modes?

### USB\_VID\_SOP

A unique 16-bit number, assigned to the Vendor by USB-IF. For USB Devices or Hubs which support USB communications the Vendor ID field shall be identical to the Vendor ID field defined in the product's USB Device Descriptor (see [USB2.0] and [USB3.2]).

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

This field shall take the same value as *Product\_VID*.

### PID\_SOP

A unique number assigned by the Vendor ID holder identifying the product.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535) .

### bcdDevice\_SOP

A unique number assigned by the Vendor ID holder containing identity information relevant to the release version of the product.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

### Num\_SVIDs\_Min\_SOP

The smallest number of SVIDs which the Qualifying Product will ever announce in response to *Discover SVIDs*.

Valid values are in the range 1 - 52.

If *SVID\_Fixed\_SOP* is set to YES, then this field shall equal *Num\_SVIDs\_Max\_SOP*.

If *SVID\_Fixed\_SOP* is set to NO, then this field shall be less than or equal to *Num\_SVIDs\_Max\_SOP*.

If *Modal\_Operation\_Supported\_SOP* is not set to YES, then this field shall be ignored by Testers.

#### Num\_SVIDs\_Max\_SOP

The largest number of SVIDs which the Qualifying Product will ever announce in response to **Discover SVIDs**.

Valid values are in the range 1 - 52.

If *SVID\_Fixed\_SOP* is set to YES, then this field shall equal *Num\_SVIDs\_Min\_SOP*.

If *SVID\_Fixed\_SOP* is set to NO, then this field shall be greater than or equal to *Num\_SVIDs\_Min\_SOP*.

This field shall equal the number of SVIDs declared for this Qualifying Product.

If *Modal\_Operation\_Supported\_SOP* is not set to YES, then this field shall be ignored by Testers.

#### SVID\_Fixed\_SOP (Y/N)

If this field is set to YES, the expectation is that Testers will check for the presence of precisely those SVIDs that are declared in the VIF, in the order in which they are given.

If this field is set to NO, the expectation is that Testers will check that the SVIDs that are declared are all included in the predefined SVIDs for this Qualifying Product.

If *Modal\_Operation\_Supported\_SOP* is not set to YES, then this field shall be ignored by Testers.

### 3.2.13.1 SOP SVIDs

In this section, the fields represent the parameters for a single SOP SVID. <X> represents the SVID number, an integer in the range of 1 - 52. If no <X> is given, or if <X> does not fall within that range, then the field shall be ignored by Testers.

SVID numbers <X> shall start at 1 and be incremented sequentially. If there is a gap in the sequence (e.g., SVIDs 1, 2, and 4 exist, but SVID 3 does not), then behavior by Testers is unspecified.

If *Modal\_Operation\_Supported\_SOP* is not set to YES, then all fields in this section shall be ignored by Testers.

#### SVID<X>\_SOP

The SVID value, used to retrieve Modes. This field shall be unique for each SOP SVID within a single component.

This field is a non-zero 4-digit hexadecimal number, with valid values in the range 1h - FFFFh (1 - 65535).

#### **SVID<X>\_Num\_Modes\_Min\_SOP**

The smallest number of Modes which will ever be announced for this SVID.

Valid values are in the range 1 - 6.

If *SVID<X>\_Modes\_Fixed\_SOP* is set to YES, then this field shall equal *SVID<X>\_Num\_Modes\_Max\_SOP*.

If *SVID<X>\_Modes\_Fixed\_SOP* is set to NO, then this field shall be less than or equal to *SVID<X>\_Num\_Modes\_Max\_SOP*.

#### **SVID<X>\_Num\_Modes\_Max\_SOP**

The largest number of Modes which will ever be announced for this SVID.

Valid values are in the range 1 - 6.

If *SVID<X>\_Modes\_Fixed\_SOP* is set to YES, then this field shall equal *SVID<X>\_Num\_Modes\_Min\_SOP*.

If *SVID<X>\_Modes\_Fixed\_SOP* is set to NO, then this field shall be greater than or equal to *SVID<X>\_Num\_Modes\_Min\_SOP*.

This field shall equal the number of Modes declared for this SVID.

#### **SVID<X>\_Modes\_Fixed\_SOP (Y/N)**

If this field is set to YES, the expectation is that Testers will check precisely those Modes that are declared in the VIF, in the order in which they are given.

*SVID<X>\_Num\_Modes\_Max\_SOP* shall equal *SVID<X>\_Num\_Modes\_Min\_SOP*.

If this field is set to NO, the expectation is that Testers will check all declared Modes can be Entered and Exited.

The expectation is that Testers will check all Modes in order to determine whether they can be Entered and Exited for all values that this field can take.

### **3.2.13.2 SOP SVID Modes**

In this section, the fields represent the modes <Y> of a specified SOP SVID <X>. <X> shall be a positive integer in the range of 1 - 52. If no <X> is given, or if <X> does not fall within that range, then the field shall be ignored by Testers. If <X> does not equal the SOP SVID number of an SOP SVID defined in this VIF, then the field shall be ignored by Testers. <Y> represents the SOP SVID Mode of the SOP SVID <X>, an integer in the range 1 - 6. If no <Y> is given, or if <Y> does not fall within that range, then the field shall be ignored by Testers

SOP SVID Mode numbers <Y> for a given SOP SVID <X> shall start at 1 and be incremented sequentially. If there is a gap in the sequence (e.g., Modes 1, 2, and 4 exist, but Mode 3 does not), then behavior by Testers is unspecified.

If *Modal\_Operation\_Supported\_SOP* is not set to YES, then all fields in this section shall be ignored by Testers.

#### *SVID<X>\_Mode<Y>\_Enter\_SOP (Y/N)*

Is it possible to Enter and Exit this Mode without any pre-condition?

This field shall be set to YES for at least one Mode.

#### *SVID<X>\_Mode<Y>\_Recog\_Mask\_SOP*

A 32-bit value which, in combination with *SVID<X>\_Mode<Y>\_Recog\_Value\_SOP*, uniquely identifies a Mode for a given SVID.

This field is a non-zero 8-digit hexadecimal number, with valid values in the range 1h - FFFFFFFFh (1 - 4294967295).

The bitwise AND of this field and *SVID<X>\_Mode<Y>\_Recog\_Value\_SOP* shall be unique among all Modes of a given SOP SVID.

If *SVID<X>\_Modes\_Fixed\_SOP* is not set to NO, then this field shall be ignored by Testers.

#### *SVID<X>\_Mode<Y>\_Recog\_Value\_SOP*

A 32-bit value which is used to uniquely identify a Mode for a given SVID.

This field is an 8-digit hexadecimal number, with valid values in the range 0h - FFFFFFFFh (0 - 4294967295).

If *SVID<X>\_Modes\_Fixed\_SOP* is YES, then this field shall be unique among all Modes of a given SOP SVID.

If *SVID<X>\_Modes\_Fixed\_SOP* is NO, then the bitwise AND of this field and *SVID<X>\_Mode<Y>\_Recog\_Mask\_SOP* shall be unique among all Modes of a given SOP SVID.

### **3.2.14 Alternate Mode Adapter (AMA) Fields**

The fields in this section shall be ignored by Testers unless *Responds\_To\_Discov\_SOP\_UFP* is set to YES, and *Product\_Type\_UFP\_SOP* is set to 5 (Alternate Mode Adapter).

#### *AMA\_HW\_Vers*

The Hardware version as assigned by the Vendor ID owner.

This field is a 1-digit hexadecimal, with valid values in the range 0h - Fh (0 - 15).

#### *AMA\_FW\_Vers*

The Firmware version as assigned by the Vendor ID owner.

This field is a 1-digit hexadecimal number, with valid values in the range 0h - Fh (0 - 15).



#### AMA\_VCONN\_Power

When the VCONN required field is set to YES, the VCONN power needed by adapter for full functionality.

Valid options are:

- 0 - 1W
- 1 - 1.5W
- 2 - 2W
- 3 - 3W
- 4 - 4W
- 5 - 5W
- 6 - 6W

If *AMA\_VCONN\_Reqd* is not set to YES, then this field shall be ignored by Testers.

#### AMA\_VCONN\_Reqd (Y/N)

Is VCONN needed for the AMA to operate?

#### AMA\_VBUS\_Reqd (Y/N)

Is VBUS needed for the AMA to operate?

#### AMA\_Superspeed\_Support

What type of USB signaling does the AMA support?

Valid options are:

- 0 - USB 2.0 only
- 1 - USB 3.2 Gen 1 (includes USB 2.0)
- 2 - USB 3.2 Gen 2 (includes Gen 1 and USB 2.0)
- 3 - USB 2.0 Billboard Only

### 3.2.15 Battery Charging 1.2 Fields

The fields in this section shall be ignored by Testers if *BC\_1\_2\_Support* is not set to 1 (Charging Port), 2 (Portable Device), or 3 (Both).

#### BC\_1\_2\_Charging\_Port\_Type

What BC 1.2 charging capabilities does this Component support? Valid options are:

- 0 - DCP
- 1 - CDP
- 2 - Both

This field shall be ignored by Testers if *BC\_1\_2\_Support* is not set to 1 (Charging Port, or 3 (Both).

### 3.2.16 Cable/eMarker Fields

The fields in this section shall be ignored by Testers unless *VIF\_Product\_Type* is set to 1 (cable) or *VIF\_Product\_Type* is set to 0 (Port Product) and *PD\_Port\_Type* is set to 5 (eMarker).

#### XID

A decimal number assigned by USB-IF prior to certification.

Valid values are in the range 0 - 1048575.

#### Data\_Capable\_As\_USB\_Host (Y/N)

Shall be set to YES if the product is capable of enumerating USB Devices.

#### Data\_Capable\_As\_USB\_Device (Y/N)

Shall be set to YES if the product is capable of enumerating as a USB Device.

#### Product\_Type

What is the product type of the Qualifying Product?

If *VIF\_Product\_Type* is set to 1 (Cable), valid options are:

- 3 - Passive Cable
- 4 - Active Cable

If *VIF\_Product\_Type* is set to 0 (Port Product) and *PD\_Port\_Type* is set to 5 (eMarker), valid options are:

- 6 - Vconn Powered Device (VPD)

#### Modal\_Operation\_Supported (Y/N)

Does the product support Modes?

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be set to NO.

#### USB\_VID

A unique 16-bit number, assigned to the Vendor by USB-IF. For USB Devices or Hubs which support USB communications the Vendor ID field shall be identical to the Vendor ID field defined in the product's USB Device Descriptor (see [\[USB2.0\]](#) and [\[USB3.2\]](#)).

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

This field shall take the same value as *Product\_VID*.

#### PID

A unique number assigned by the Vendor ID holder identifying the product.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

### bcdDevice

A unique number assigned by the Vendor ID holder containing identity information relevant to the release version of the product.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535)

### Cable\_HW\_Vers

The Hardware version as assigned by the Vendor ID owner.

This field is a 1-digit hexadecimal number, with valid values in the range 0h - Fh (0 - 15)

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### Cable\_FW\_Vers

The Hardware version as assigned by the Vendor ID owner.

This field is a 1-digit hexadecimal number, with valid values in the range 0h - Fh (0 - 15).

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### Type\_C\_To\_Type\_A\_B\_C

What is the connector type on the opposite end from the USB Type-C connector?

Valid options are:

- 0 - Type-A
- 1 - Type-B
- 2 - Type-C

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### Type\_C\_To\_Type\_C\_Capt\_Vdm\_V2

What is the connector type at the opposite end from the USB Type-C connector?

Valid options are:

- 2 - USB Type-C
- 3 - Captive

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### Cable\_Latency

A value corresponding to the signal latency—the cable which can be used as an approximation for its length.

If *Product\_Type* is equal to 3 (Passive Cable), then valid options are:

- 1 - < 10ns
- 2 - 10ns - 20ns
- 3 - 20ns - 30ns
- 4 - 30ns - 40ns
- 5 - 40ns - 50ns
- 6 - 50ns - 60ns
- 7 - 60ns - 70ns
- 8 - > 70ns

If *Product\_Type* is equal to 4 (Active Cable), then valid options are:

- 1 - <10ns
- 2 - 10ns - 20ns
- 3 - 20ns - 30ns
- 4 - 30ns - 40ns
- 5 - 40ns - 50ns
- 6 - 50ns - 60ns
- 7 - 60ns - 70ns
- 8 - 1000ns
- 9 - 2000ns
- 10 - 3000ns

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### Cable\_Termination\_Type

To what extent is VCONN required in order to power the Qualifying Product?

If *Product\_Type* is equal to 3 (Passive Cable), then valid options are:

- 0 - Both ends Passive, VCONN not required
- 1 - Both ends Passive, VCONN required

Note: if this field is equal to 0 (Both ends Passive, VCONN not required), VCONN may still be required for initialization.

If *Product\_Type* is equal to 4 (Active Cable), then valid options are:

- 2 - One end Active, one end passive, VCONN required
- 3 - Both ends Active, VCONN required

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### Cable\_VBUS\_Current

What current is the Qualifying Product capable of carrying over VBUS?

Valid options are:

- 1 - 3A
- 2 - 5A

If *VBUS\_Through\_Cable* is not set to YES, then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### VBUS\_Through\_Cable (Y/N)

Does the cable contain an end to end VBUS wire?

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### Cable\_Superspeed\_Support

What is the highest USB signaling speed that the Qualifying Product supports when operating in PD Revision 2 mode?

Valid options are:

- 0 - USB 2.0 only, no SuperSpeed support
- 1 - USB 3.1 Gen1 (Includes USB 2)
- 2 - USB 3.1 Gen1 and Gen2 (Includes USB 2)

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### Cable\_USB\_Highest\_Speed

What is the highest USB signaling speed that the Qualifying Product supports when operating in PD Revision 3 mode?

Valid options are:

- 0 - USB 2 only, no Superspeed support
- 1 - USB 3.2 Gen 1
- 2 - USB3.2/USB4 Gen2
- 3 - USB4 Gen3

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

### Max\_VBUS\_Voltage\_Vdm\_V2

What is the maximum voltage that shall be negotiated using a Fixed Supply over the cable as part of an Explicit Contract where the maximum voltage that shall be applied to the cable is *vSrcNew* max + *vSrcValid* max?

Valid options are:

- 0 - 20V
- 1 - 30V
- 2 - 40V
- 3 - 50V

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### Manufacturer\_Info\_Supported (Y/N)

Is the *Get\_Manufacturer\_Info* request supported?

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

This field shall take the same value as *Product\_VID*.

### Manufacturer\_Info\_VID

The Vendor ID, as assigned by USB-IF.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

If *Manufacturer\_Info\_Supported* is not set to YES, then this field shall be ignored by Testers

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### Manufacturer\_Info\_PID

The Product ID, as assigned by the vendor.

This field is a 4-digit hexadecimal number, with valid values in the range 0h - FFFFh (0 - 65535).

If *Manufacturer\_Info\_Supported* is not set to YES, then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers

### Chunking\_Implemented (Y/N)

Does this Qualifying Product implement an extended message chunking layer, as defined in Chapter 6 of *[PowerDelivery3.0]*?

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### Security\_Msgs\_Supported (Y/N)

Set to YES if the Qualifying Product responds to a *Security\_Request* message with a *Security\_Response* message.

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### ID\_Header\_Connector\_Type

Is this connector a plug or a receptacle?

Valid options are:

0 - Cable

2 - USB Type-C Receptacle

3 - USB Type-C Plug

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

#### Cable\_Num\_SVIDs\_Min

The smallest number of SVIDs which the Qualifying Product will ever announce in response to **Discover SVIDs**.

Valid values are in the range 1 - 52.

If *SVID\_fixed* is set to YES, then this field shall equal *Cable\_Num\_SVIDs\_Max*.

If *SVID\_fixed* is set to NO, then this field shall be less than or equal to *Cable\_Num\_SVIDs\_Max*.

If *Modal\_Operation\_Supported* is not set to YES, then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

#### Cable\_Num\_SVIDs\_Max

The largest number of SVIDs which the Qualifying Product will ever announce in response to **Discover SVIDs**.

Valid values are in the range 1 - 52.

If *SVID\_Fixed* is set to YES, then this field shall be equal to *Cable\_Num\_SVIDs\_Min*.

If *SVID\_Fixed* is set to NO, then this field shall be greater than or equal to *Cable\_Num\_SVIDs\_Min*.

This field shall equal the number of SVIDs declared for this Qualifying Product.

If *Modal\_Operation\_Supported* is not set to YES, then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

#### SVID\_Fixed (Y/N)

If this field is set to YES, the expectation is that Testers will check for the presence of precisely those SVIDs that are declared in the VIF, in the order in which they are given.

If this field is set to NO, the expectation is that Testers will check that the SVIDs that are declared are all included in the predefined SVIDs for this Qualifying Product.

If *Modal\_Operation\_Supported* is not set to YES, then this field shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then this field shall be ignored by Testers.

### 3.2.16.1 Cable SVIDs

In this section, the fields represent the parameters for a single Cable SVID. <X> represents the SVID number, an integer in the range of 1 - 52. If no <X> is given, or if <X> does not fall within that range, then the field shall be ignored by Testers.

SVID numbers <X> shall start at 1 and be incremented sequentially. If there is a gap in the sequence (e.g., SVIDs 1, 2, and 4 exist, but SVID 3 does not), then behavior by Testers is unspecified.

If *Modal\_Operation\_Supported* is not set to YES, then all fields in this section shall be ignored by Testers.

If *VIF\_Product\_Type* is not set to 1 (Cable), then all fields in this section shall be ignored by Testers.

#### SVID<X>

The SVID value, used to retrieve Modes. This field shall be unique for each cable SVID within a single component.

This field is a non-zero 4-digit hexadecimal number, with valid values in the range 1h - FFFFh (1 - 65535).

#### SVID<X>\_Num\_Modes\_Min

The smallest number of Modes which will ever be announced for this SVID.

Valid values are in the range 1 - 6.

If *SVID<X>\_Modes\_Fixed* is set to YES, then this field shall equal *SVID<X>\_Num\_Modes\_Max*.

If *SVID<X>\_Modes\_Fixed* is set to NO, then this field shall be less than or equal to *SVID<X>\_Num\_Modes\_Max*.

#### SVID<X>\_Num\_Modes\_Max

The largest number of Modes which will ever be announced for this SVID.

Valid values are in the range 1 - 6.

If *SVID<X>\_Modes\_Fixed* is set to YES, then this field shall equal *SVID<X>\_Num\_Modes\_Min*.

If *SVID<X>\_Modes\_Fixed* is set to NO, then this field shall be greater than or equal to *SVID<X>\_Num\_Modes\_Min*.

This field shall equal the number of Modes declared for this SVID.

#### SVID<X>\_Modes\_Fixed (Y/N)

If this field is set to YES, the expectation is that Testers will check precisely those Modes that are declared in the VIF, in the order in which they are given.

If this field is set to NO, the expectation is that Testers will check that all declared Modes can be Entered and Exited.



It is expected that Testers will check all Modes in order to determine whether they can be Entered and Exited for all values that this field can take.

### 3.2.16.2 Cable SVID Modes

In this section, the fields represent the Modes <Y> of a specified Cable SVID <X>. <X> shall be a positive integer in the range of 1 - 52. If no <X> is given, or if <X> does not fall within that range, then the field shall be ignored by Testers. If <X> does not equal the Cable SVID number of a Cable SVID defined in this VIF, then the field shall be ignored by Testers. <Y> represents the Cable SVID Mode of the Cable SVID <X>, an integer in the range 1 - 6. If no <Y> is given, or if <Y> does not fall within that range, then the field shall be ignored by Testers.

SVID Mode numbers <Y> for a given Cable SVID <X> shall start at 1 and be incremented sequentially. If there is a gap in the sequence (e.g., Modes 1, 2, and 4 exist, but Mode 3 does not), then behavior by Testers is unspecified.

If *Modal\_Operation\_Supported* is not set to YES, then all fields in this section shall be ignored by Testers.

#### SVID<X>\_Mode<Y>\_Enter (Y/N)

Is it possible to Enter and Exit this Mode without any pre-condition?

This field shall be set to YES for at least one Mode.

#### SVID<X>\_Mode<Y>\_Recog\_Mask

A 32-bit value which, in combination with *SVID<X>\_Mode<Y>\_Recog\_Value*, uniquely identifies a Mode for a given SVID.

This field is a non-zero 8-digit hexadecimal number, with valid values in the range 1h - FFFFFFFFh (1 - 4294967295).

The bitwise AND of this field and *SVID<X>\_Mode<Y>\_Recog\_Value* shall be unique among all Modes of a given Cable SVID.

If *SVID<X>\_Modes\_Fixed* is not set to NO, then this field shall be ignored by Testers.

#### SVID<X>\_Mode<Y>\_Recog\_Value

A 32-bit value which is used to uniquely identify a Mode for a given SVID.

This field is an 8-digit hexadecimal number, with valid values in the range 0h - FFFFFFFFh (0 - 4294967295).

If *SVID<X>\_Modes\_Fixed* is set to YES, then this field shall be unique among all Modes of a given Cable SVID.

If *SVID<X>\_Modes\_Fixed* is set to NO, then the bitwise AND of this field and *SVID<X>\_Mode<Y>\_Recog\_Mask* shall be unique among all Modes of a given Cable SVID.

### 3.2.17 Active Cable Fields

Unless otherwise specified, if *Product\_Type* is not set to 4 (Active Cable) then all fields in this section shall be ignored by Testers.

#### Cable\_SOP\_PP\_Controller (Y/N)

Is an SOP" Controller Present?

#### SBU\_Supported (Y/N)

Does the Qualifying Product support SBU lines?

#### SBU\_Type

Are the SBUs active or passive?

Valid options are:

- 0 - SBU is Passive
- 1 - SBU is Active

If *SBU\_Supported* is not set to 0, then this field shall be ignored by Testers.

#### Active\_Cable\_Operating\_Temp\_Support (Y/N)

Does the Qualifying Product report the current Operating Temperature in a *PPS\_Status* message?

#### Active\_Cable\_Max\_Operating\_Temp

What is the maximum allowable operating temperature in degrees Celsius inside the plug, in degrees centigrade?

Valid values are in the range 1 - 255.

If *Active\_Cable\_Operating\_Temp\_Support* is not set to YES, then this field shall be ignored by Testers.

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_Shutdown\_Temp\_Support (Y/N)

Does the Qualifying Product support Thermal Shutdown?

#### Active\_Cable\_Shutdown\_Temp

What is the temperature in degrees Celsius inside the plug at which the plug will shut down its active signaling components?

Valid values are in the range 1 - 255.

If *Active\_Cable\_Shutdown\_Temp\_Support* is not set to YES, then this field shall be ignored by Testers.

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_U3\_CLd\_Power

How much power does the Qualifying Product consume while in U3 or CLd?

Valid options are:

- 0 - >10mW
- 1 - 5-10mW
- 2 - 1-5mW
- 3 - 0.5-1mW
- 4 - 0.2-0.5mW
- 5 - 50-200μW
- 6 - <50μW

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_U3\_U0\_Trans\_Mode

What is the Qualifying Product's U3 to U0 transition mode?

Valid options are:

- 0 - U3 to U0 direct
- 1 - U3 to U0 through U3S

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_Physical\_Connection

What is the material from which the Qualifying Product is constructed?

Valid options are:

- 0 - Copper
- 1 - Optical

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_Active\_Element

What is the cable's active element?

Valid options are:

- 0 - Active Re-driver
- 1 - Active Re-timer

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_USB4\_Support (Y/N)

Does the Qualifying Product support USB4?

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_USB2\_Supported (Y/N)

Does the Qualifying Product support USB 2.0 only signaling?

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_USB2\_Hub\_Hops\_Consumed

How many USB2 hub hops does the Qualifying Product consume?

Valid options are in the range 0 - 3

If *Active\_Cable\_USB2\_Supported* is set to YES, then this field shall be ignored by Testers.

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_USB32\_Supported (Y/N)

Does the Qualifying Product support USB 3.2 signaling?

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_USB\_Lanes

How many USB 3.2 Superspeed lanes does the Qualifying Product support?

Valid options are:

0 - One lane

1 - Two lanes

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_Optically\_Isolated (Y/N)

Is the Qualifying Product optically isolated as defined in **[USBType-C2.0]**?

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

#### Active\_Cable\_USB\_Gen

Which level of USB signaling Gen does the Qualifying Product support?

Valid options are:

0 - Gen 1

1 - Gen 2 or higher

If *PD\_Specification\_Revision* is not set to 2 (Revision 3), this field shall be ignored by Testers.

### 3.2.18 VCONN Powered Device (VPD) Fields

The fields in this section shall be ignored by Testers unless *VIF\_Product\_Type* is set to 0 (Port Product), *PD\_Port\_Type* is set to 5 (eMarker), and *Product\_Type* is set to 6 (Vconn Powered Device).

#### VPD\_HW\_Vers

The Hardware version as assigned by the Vendor ID owner.

This field is a 1-digit hexadecimal number, with valid values in the range 0h - Fh (0 - 15).

#### VPD\_FW\_Vers

The Firmware version as assigned by the Vendor ID owner.

This field is a 1-digit hexadecimal number, with valid values in the range 0h - Fh (0 - 15).

#### VPD\_Max\_VBUS\_Voltage

What is the maximum voltage that a Sink Shall negotiate through the VPD Charge-Through port as part of an Explicit Contract?

Valid options are:

- 0 - 20V
- 1 - 30V (deprecated)
- 2 - 40V (deprecated)
- 3 - 50V

#### VPD\_Charge\_Through\_Support (Y/N)

Does the Qualifying Product support Charge-Through?

#### VPD\_Charge\_Through\_Current

What is the highest Charge-Through current that the Qualifying Product is capable?

Valid options are:

- 0 - 3A Capable
- 1 - 5A Capable

If *VPD\_Charge\_Through\_Support* is not set to 1 (VPD Supports Charge-Through), then this field shall be ignored by Testers.

#### VPD\_VBUS\_Impedance

The VBUS Impedance, in mΩ units.

Valid values are in the range 10 - 63.

If *VPD\_Charge\_Through\_Support* is not set to 1 (VPD Supports Charge-Through), then this field shall be ignored by Testers.

### VPD\_Ground\_Impedance

The Ground Impedance, in mΩ units.

Valid values are in the range 10 - 63.

If *VPD\_Charge\_Through\_Support* is set to 0, then this field shall be ignored by Testers.

## 3.2.19 Repeater Fields

The fields in this section shall be ignored by Testers unless either *VIF\_Product\_Type* is set to 2 (Repeater), or *VIF\_Product\_Type* is set to 1 (Cable) and *Product\_Type* is set to 4 (Active Cable).

### Repeater\_One\_Type

The basic architecture of the Repeater under consideration. If *VIF\_Product\_Type* is set to 2 (Repeater), then this is the Qualifying Product itself. If *Product\_Type* is set to 4 (Active Cable), then this is the first Repeater in the Qualifying Product.

Valid options are:

- 0 - SRIS (Separate Reference clock Independent SSC) Re-timer
- 1 - Bit-Level Re-timer
- 2 - Linear Re-driver

### Repeater\_Two\_Type

The basic architecture of the second Repeater in an Active Cable with both ends active.

Valid options are:

- 0 - SRIS (Separate Reference clock Independent SSC) Re-timer
- 1 - Bit-Level Re-timer
- 2 - Linear Re-driver

If *Cable\_Termination\_Type* is not set to 3 (Both ends Active, VCONN required) then this field shall be ignored by Testers.

## 3.2.20 Product Power Fields

The fields in this section shall be ignored by Testers unless *Connector\_Type* is set to 0 (Type-A) or 3 (Micro A/B), or *Connector\_Type* is set to 2 (Type-C) and *Type\_C\_State\_Machine* is set to 0 (SRC) or 2 (DRP).

### Product\_Total\_Source\_Power\_mW

The total power in milliwatts, rounded up to the nearest milliwatt, that the Qualifying Product can deliver across all its ports.

Valid values are in the range 0 - 1000000 (0 - 1000000 mW).

This field shall have the same value for all components wherein this field is required.

### Port\_Source\_Power\_Type

Is the Qualifying Product guaranteed to advertise all PDOs it is capable of supporting (power is assured), or is it part of a power gang with other ports, and may reduce its output accordingly (power is shared)? Valid options are:

- 0 - Assured
- 1 - Shared

### < Port\_Source\_Power\_Gang >, \$Port\_Source\_Power\_Gang

The name of the power gang of which the Qualifying Product belongs.

This field shall be ignored by Testers if *Port\_Source\_Power\_Type* is not set to 1 (Shared).

### Port\_Source\_Power\_Gang\_Max\_Power

The maximum power in milliwatts, rounded up to the nearest milliwatt, that can be drawn from the power gang in total across all shared ports.

Valid values are in the range 0 - 1000000 (0 - 1000000 mW), but shall be less than or equal to the value of *Product\_Total\_Source\_Power\_mW*.

This field shall be ignored by Testers if *Port\_Source\_Power\_Type* is not set to 1 (Shared).

In all ports belonging to the same power gang (that is, where *\$Port\_Source\_Power\_Gang* is equal), this field shall have the same value.

## **Appendix A: XML Schema Definition for XML-based VIF**

The XML Schema that describes a conformant Vendor Info File may be downloaded from <https://compliance.usb.org/cv/VendorInfoFile/Schemas/Current/>.

In the event of a conflict between the XML Schema and the contents of this specification, the schema takes precedence.



## Appendix B: Settings for USB4 Product Types

	USB4 Host w/ USB4 DRD	USB4 Host no USB4 DRD	USB4 Hub (not a dock) UFP	USB4 Hub (not a dock) DFP	USB4 Dock UFP	USB4 Dock DFP	USB4 Peripheral
USB4_DFP_Supported	YES	YES	NO	YES	NO	YES	NO
USB4_UFP_Supported	YES	NO	YES	NO	YES	NO	YES
Type_C_Port_On_Hub	NO	NO	YES	YES	YES	YES	NO
USB4_Dock	NO	NO	NO	NO	YES	YES	NO

## Appendix C: Removed Fields

Fields that are no longer a part of this specification. Unless otherwise specified, fields in this section will not be removed from the XML Schema, and a VIF that contains any of them will remain conformant.

[Type\\_C\\_To\\_Plug\\_Receptacle](#) - Removed in version 3.10

[Retimer\\_Type](#) - Removed in version 3.10

[Active\\_Cable\\_USB2\\_Hub\\_Hops\\_Supported](#) - Renamed to  
*Active\_Cable\_USB2\_Hub\_Hops\_Consumed* in version 3.12

[Active\\_Cable\\_Optically\\_Isololated](#) - A typo introduced in version 3.10. Renamed to  
*Active\_Cable\_Optically\_Isolated* in version 3.12

## Index of Field Names

\$VIF\_Producer, 20, 25  
 \$VIF\_Specification, 25  
 Accepts\_PR\_Swap\_As\_Snk, 59  
 Accepts\_PR\_Swap\_As\_Src, 59  
 Active\_Cable\_Active\_Element, 75  
 Active\_Cable\_Max\_Operating\_Temp, 74  
 Active\_Cable\_Operating\_Temp\_Support, 74  
 Active\_Cable\_Optically\_Isolated, 82  
 Active\_Cable\_Optically\_Isolated, 76, 82  
 Active\_Cable\_Physical\_Connection, 75  
 Active\_Cable\_Shutdown\_Temp, 74  
 Active\_Cable\_Shutdown\_Temp\_Support, 74, 75  
 Active\_Cable\_U3\_CLd\_Power, 75  
 Active\_Cable\_U3\_U0\_Trans\_Mode, 75  
 Active\_Cable\_USB\_Gen, 76  
 Active\_Cable\_USB\_Lanes, 76  
 Active\_Cable\_USB2\_Hub\_Hops\_Consumed, 76, 82  
 Active\_Cable\_USB2\_Hub\_Hops\_Supported, 82  
 Active\_Cable\_USB2\_Supported, 76  
 Active\_Cable\_USB32\_Supported, 76  
 Active\_Cable\_USB4\_Support, 75  
 AMA\_FW\_Vers, 64  
 AMA\_HW\_Vers, 64  
 AMA\_Superspeed\_Support, 65  
 AMA\_VBUS\_Reqd, 65  
 AMA\_VCONN\_Power, 65  
 AMA\_VCONN\_Reqd, 65  
 Attempts\_Discov\_SOP, 34  
 BC\_1\_2\_Charging\_Port\_Type, 65  
 BC\_1\_2\_Support, 30, 65  
 bcdDevice, 67  
 bcdDevice\_SOP, 61  
 Cable\_FW\_Vers, 67  
 Cable\_HW\_Vers, 67  
 Cable\_Latency, 67  
 Cable\_Num\_SVIDs\_Max, 71  
 Cable\_Num\_SVIDs\_Min, 71  
 Cable\_SOP\_PP\_Controller, 74  
 Cable\_Superspeed\_Support, 69  
 Cable\_Termination\_Type, 68, 78  
 Cable\_USB\_Highest\_Speed, 69  
 Cable\_VBUS\_Current, 68  
 Captive\_Cable, 28, 30, 40  
 Certification\_Type, 26, 27  
 Chunking\_Implemented, 70  
 Chunking\_Implemented\_SOP, 35  
 Connector\_Type, 28, 29, 30, 31, 38, 48, 49, 50, 78  
 Data\_Capable\_As\_USB\_Device\_SOP, 60  
 Data\_Capable\_As\_USB\_Host, 66  
 Data\_Capable\_As\_USB\_Host\_SOP, 60  
 Device\_Contains\_Captive\_Retimer, 48  
 Device\_Gen1x1\_tLinkTurnaround, 49  
 Device\_Gen2x1\_tLinkTurnaround, 49  
 Device\_Speed, 48, 49  
 Device\_Supports\_USB\_Data, 48, 49  
 Device\_Truncates\_DP\_For\_tDHPResponse, 48, 49  
 DFP\_VDO\_Port\_Number, 27, 28, 61  
 DR\_Swap\_To\_DFP\_Supported, 32  
 DR\_Swap\_To\_UFP\_Supported, 32  
 FR\_Swap\_Reqd\_Type\_C\_Current\_As\_Initial\_Source, 57  
 FR\_Swap\_Supported\_As\_Initial\_Sink, 59  
 FR\_Swap\_Type\_C\_Current\_Capability\_As\_Initial\_Sink, 52  
 GiveBack\_May\_Be\_Set, 56  
 Higher\_Capability\_Set, 56  
 Host\_Contains\_Captive\_Retimer, 50  
 Host\_Gen1x1\_tLinkTurnaround, 50  
 Host\_Gen2x1\_tLinkTurnaround, 51  
 Host\_Is\_Embedded, 51  
 Host\_Speed, 49, 50, 51  
 Host\_Supports\_USB\_Data, 49, 50, 51  
 Host\_Suspend\_Supported, 51  
 Host\_Truncates\_DP\_For\_tDHPResponse, 50, 51  
 Hub\_Port\_Number, 50  
 ID\_Header\_Connector\_Type, 70  
 ID\_Header\_Connector\_Type\_SOP, 37  
 Is\_DFP\_On\_Hub, 50  
 Manufacturer\_Info\_PID, 70  
 Manufacturer\_Info\_PID\_Port, 35  
 Manufacturer\_Info\_Supported, 69, 70  
 Manufacturer\_Info\_Supported\_Port, 35, 36  
 Manufacturer\_Info\_VID, 27, 70  
 Manufacturer\_Info\_VID\_Port, 27, 35  
 Master\_Port, 52  
 Max\_VBUS\_Voltage\_Vdm\_V2, 69  
 Modal\_Operation\_Supported, 66, 71, 72, 73  
 Modal\_Operation\_Supported\_SOP, 61, 62, 64

Model\_Part\_Number, 26  
 No\_USB\_Suspend\_May\_Be\_Set, 56  
 Num\_Fixed\_Batteries, 36  
 Num\_Snk\_PDOs, 57  
 Num\_Src\_PDOs, 52  
 Num\_SVIDs\_Max\_SOP, 62  
 Num\_SVIDs\_Min\_SOP, 61, 62  
 Num\_Swappable\_Battery\_Slots, 36  
 PD\_OC\_Protection, 52, 53  
 PD\_OCP\_Method, 53, 55  
 PD\_Port\_Type, 29, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 51, 56, 59, 66, 77  
 PD\_Power\_As\_Sink, 56  
 PD\_Power\_As\_Source, 51  
 PD\_Spec\_Revision\_Major, 13, 31, 32  
 PD\_Spec\_Revision\_Minor, 13, 31  
 PD\_Spec\_Version\_Major, 13, 31  
 PD\_Spec\_Version\_Minor, 13, 31  
 PD\_Specification\_Revision, 32, 34, 35, 36, 37, 52, 53, 57, 59, 61, 67, 69, 70, 71, 74, 75, 76  
 PID, 66  
 PID\_SOP, 61  
 Port\_Battery\_Powered, 30, 31, 36  
 Port\_Label, 27, 61  
 Port\_Source\_Power\_Gang, 79  
 Port\_Source\_Power\_Gang\_Max\_Power, 79  
 Port\_Source\_Power\_Type, 79  
 Product\_Revision, 26  
 Product\_Total\_Source\_Power\_mW, 78, 79  
 Product\_Type, 66, 68, 74, 77, 78  
 Product\_Type\_DFP\_SOP, 34, 60  
 Product\_Type\_UFP\_SOP, 60, 64  
 Product\_VID, 27, 35, 61, 66, 70  
 Repeater\_Two\_Type, 78  
 Requests\_PR\_Swap\_As\_Snk, 59  
 Requests\_PR\_Swap\_As\_Src, 59  
 Responds\_To\_Discov\_SOP\_DFP, 34, 59, 61  
 Responds\_To\_Discov\_SOP\_UFP, 33, 34, 40, 59, 64  
 Retimer\_Type, 78, 82  
 RP\_Value, 38  
 SBU\_Supported, 74  
 SBU\_Type, 74  
 Security\_Msgs\_Supported, 70  
 Security\_Msgs\_Supported\_SOP, 36  
 Sends\_Pings, 52  
 Snk\_PDO\_Max\_Voltage<X>, 58  
 Snk\_PDO\_Min\_Voltage<X>, 58  
 Snk\_PDO\_Op\_Current<X>, 58  
 Snk\_PDO\_Op\_Power<X>, 58  
 Snk\_PDO\_Supply\_Type<X>, 57, 58, 59  
 Snk\_PDO\_Voltage<X>, 57  
 SOP\_Capable, 37  
 SOP\_P\_Capable, 37  
 SOP\_P\_Debug\_Capable, 37  
 SOP\_PP\_Capable, 37  
 SOP\_PP\_Debug\_Capable, 38  
 Src\_PD\_OCP\_OC\_Debounce<X>, 54  
 Src\_PD\_OCP\_OC\_Threshold<X>, 55  
 Src\_PD\_OCP\_UV\_Debounce<X>, 55  
 Src\_PD\_OCP\_UV\_Threshold\_Type<X>, 55  
 Src\_PD\_OCP\_UV\_Threshold<X>, 55  
 Src\_PDO\_Max\_Current<X>, 54, 55  
 Src\_PDO\_Max\_Power<X>, 54  
 Src\_PDO\_Max\_Voltage<X>, 54  
 Src\_PDO\_Min\_Voltage<X>, 54  
 Src\_PDO\_Peak\_Current<X>, 53  
 Src\_PDO\_Supply\_Type<X>, 53, 54, 55, 58  
 Src\_PDO\_Voltage<X>, 53, 55  
 SVID\_fixed, 71  
 SVID\_Fixed, 71  
 SVID\_Fixed\_SOP, 62  
 SVID<X>, 72  
 SVID<X>\_Mode<Y>\_Enter, 73  
 SVID<X>\_Mode<Y>\_Enter\_SOP, 64  
 SVID<X>\_Mode<Y>\_Recog\_Mask, 24, 73  
 SVID<X>\_Mode<Y>\_Recog\_Mask\_SOP, 64  
 SVID<X>\_Mode<Y>\_Recog\_Value, 73  
 SVID<X>\_Mode<Y>\_Recog\_Value\_SOP, 64  
 SVID<X>\_Modes\_Fixed, 72, 73  
 SVID<X>\_Modes\_Fixed\_SOP, 63, 64  
 SVID<X>\_Num\_Modes\_Max, 72  
 SVID<X>\_Num\_Modes\_Max\_SOP, 63  
 SVID<X>\_Num\_Modes\_Min, 72  
 SVID<X>\_Num\_Modes\_Min\_SOP, 63  
 SVID<X>\_SOP, 62  
 TID, 26  
 Type\_C\_Can\_Act\_As\_Device, 32, 33, 39, 40, 41, 48, 50, 60  
 Type\_C\_Can\_Act\_As\_Host, 32, 33, 39, 40, 41, 49, 50, 60  
 Type\_C\_Implements\_Try\_SNK, 38  
 Type\_C\_Implements\_Try\_SRC, 38  
 Type\_C\_Is\_Alt\_Mode\_Adapter, 40, 60  
 Type\_C\_Is\_Alt\_Mode\_Controller, 32, 33, 39, 60  
 Type\_C\_Is\_Debug\_Target\_SNK, 39  
 Type\_C\_Is\_Debug\_Target\_SRC, 39  
 Type\_C\_Is\_VCONN\_Powered\_Accessory, 38  
 Type\_C\_Port\_On\_Hub, 32, 40, 50  
 Type\_C\_Power\_Source, 40  
 Type\_C\_Sources\_VCONN, 30, 33, 40

Type\_C\_State\_Machine, 29, 30, 31, 32, 33, 38, 39, 40, 49, 60, 78  
 Type\_C\_Supports\_Audio\_Accessory, 40  
 Type\_C\_Supports\_VCONN\_Powered\_Accessory, 38  
 Type\_C\_To\_Plug\_Receptacle, 82  
 Type\_C\_To\_Type\_A\_B\_C, 67  
 Type\_C\_To\_Type\_C\_Capt\_Vdm\_V2, 67  
 Unchunked\_Extended\_Messages\_Supported, 35  
 Unconstrained\_Power, 17, 33  
 USB\_Comms\_Capable, 32, 39, 40  
 USB\_PD\_Support, 28, 29, 31, 39, 40  
 USB\_Suspend\_May\_Be\_Cleared, 52  
 USB\_VID, 27, 66  
 USB\_VID\_SOP, 27, 61  
 USB4\_Audio\_Supported, 43  
 USB4\_CL1\_State\_Supported, 42  
 USB4\_CL2\_State\_Supported, 42  
 USB4\_Comms\_Networking\_Supported, 44  
 USB4\_DFP\_Supported, 24, 32, 34, 37, 39, 41  
 USB4\_Dock, 25, 43  
 USB4\_DP\_Bit\_Rate, 42  
 USB4\_DP\_Tunneling\_Supported, 41, 42, 45  
 USB4\_HID\_Supported, 43  
 USB4\_Lane\_0\_Adapter, 41  
 USB4\_Mass\_Storage\_Supported, 44  
 USB4\_Max\_Speed, 41  
 USB4\_Media\_Transfer\_Protocol\_Supported, 44  
 USB4\_Monitor\_Device\_Supported, 44  
 USB4\_Num\_DP\_IN\_Adapters<X>, 45  
 USB4\_Num\_DP\_Lanes, 42  
 USB4\_Num\_DP\_OUT\_Adapters<X>, 45  
 USB4\_Num\_Internal\_Host\_Controllers, 43  
 USB4\_Num\_Lane\_Adapters<X>, 45  
 USB4\_Num\_PClE\_DN\_Adapters<X>, 46, 47  
 USB4\_Num\_PClE\_DN\_Bridges, 43  
 USB4\_Num\_PClE\_Endpoints<X>, 47  
 USB4\_Num\_PClE\_Endpoints<X>., 47  
 USB4\_Num\_Retimers, 42  
 USB4\_Num\_Unused\_Adapters<X>, 46  
 USB4\_Num\_USB3\_DN\_Adapters<X>, 45  
 USB4\_PClE\_Endpoint<X>\_Class\_Code<YY>, 48  
 USB4\_PClE\_Endpoint<X>\_Device\_ID<Y>, 47  
 USB4\_PClE\_Endpoint<X>\_Vendor\_ID<Y>, 47  
 USB4\_PClE\_Switch\_Device\_ID<X>, 47  
 USB4\_PClE\_Switch\_Vendor\_ID<X>, 47  
 USB4\_PClE\_Tunneling\_Supported, 41, 43, 46  
 USB4\_PClE\_Wake\_Supported<X>, 46  
 USB4\_Printer\_Supported, 43  
 USB4\_Router\_Id<X>, 25  
 USB4\_Router\_ID<X>, 28, 44  
 USB4\_Router\_Index, 25, 28  
 USB4\_Silicon\_VID<X>, 45  
 USB4\_Smart\_Card\_Supported, 44  
 USB4\_Still\_Image\_Capture\_Supported, 44  
 USB4\_Supported, 24, 28, 29, 31, 32, 40, 42, 61  
 USB4\_TBT3\_Compatibility\_Supported, 42, 46  
 USB4\_TBT3\_Not\_Supported<X>, 46, 47  
 USB4\_TBT3\_VID<X>, 46  
 USB4\_UFP\_Supported, 24, 34, 40, 41  
 USB4\_USB3\_Tunneling\_Supported, 41, 46  
 USB4\_USB3\_Wake\_Supported<X>, 46  
 USB4\_Video\_Supported, 44  
 VBUS\_Through\_Cable, 68, 69  
 VCONN\_Swap\_To\_Off\_Supported, 33  
 VCONN\_Swap\_To\_On\_Supported, 33, 40  
 Vendor\_Name, 26  
 VIF\_Product\_Type, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 66, 67, 68, 69, 70, 71, 72, 77, 78  
 VPD\_Charge\_Through\_Current, 77  
 VPD\_Charge\_Through\_Support, 77, 78  
 VPD\_FW\_Vers, 77  
 VPD\_Ground\_Impedance, 78  
 VPD\_HW\_Vers, 77  
 VPD\_Max\_VBUS\_Voltage, 77  
 VPD\_VBUS\_Impedance, 77  
 XID, 66  
 XID\_SOP, 59